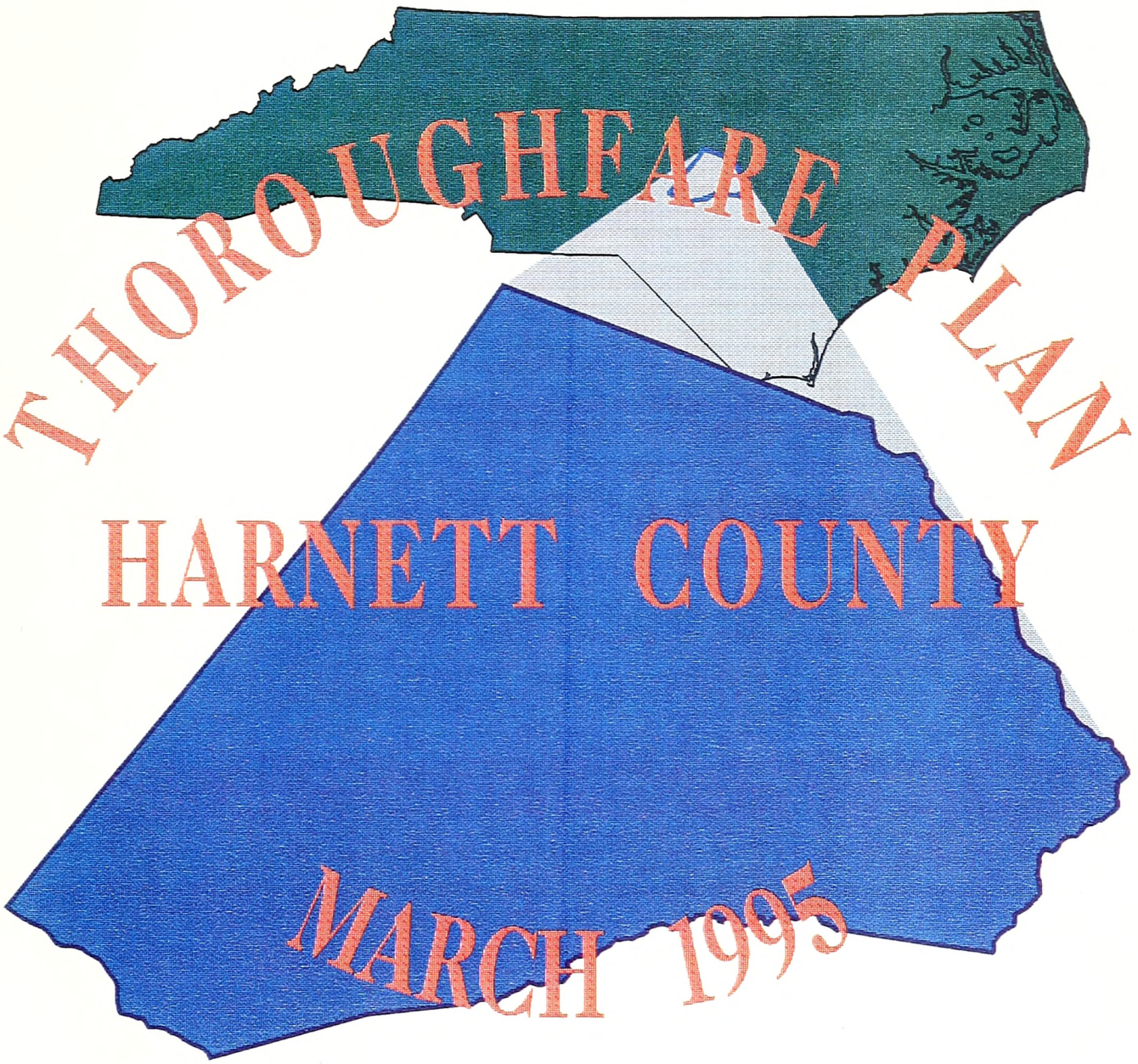
North Carolina Department of Transportation
Statewide Planning Branch
Small Urban Planning Unit



THOROUGHFARE PLAN

HARNETT COUNTY

MARCH 1995

HARNETT COUNTY THOROUGHFARE PLAN

Prepared by the:

Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In cooperation with:

Harnett County
The Federal Highway Administration
U. S. Department of Transportation

March, 1995

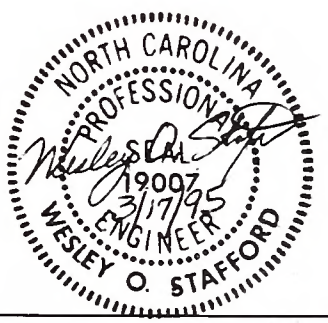


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Table of Contents

List of Tables

List of Figures

Appendices

Chapter 1

Introduction

Overview

Officials of Harnett County, prompted by a desire to adequately plan for the future transportation needs of Harnett County, requested the North Carolina Department of Transportation's (NCDOT) assistance in conducting a thoroughfare plan study. The primary concern of the County Commissioners' was the explosive growth occurring in the southwestern portion of the County and how this growth might impact the existing transportation system.

The objective of thoroughfare planning is to enable the transportation network to be progressively developed to adequately meet the transportation needs of a community or region as land develops and traffic volumes increase. By not planning now for our future transportation needs, unnecessary costs to the physical, social, and economic environment may very well be incurred. Thoroughfare planning is a tool that can be used by local officials to plan for future transportation needs, while at the same time reducing the costs to our environment.

The primary purpose of this report is to present the findings and recommendations of the thoroughfare plan study conducted for Harnett County. The secondary purpose of this report is to document the basic thoroughfare planning principles and procedures used in developing these recommendations. This report can be divided into three parts. The first part of the report, covered in Chapter 1, covers the highlights of the study. Chapters 2 and 3 provide a detailed description of the Thoroughfare Plan study recommendations and address different methods by which these recommendations can be implemented. The final chapter, Chapter 4, covers study procedure and findings.

Information that will be especially useful to the practitioner is provided in the Appendix. The principles of thoroughfare planning are covered in Appendix A, a detailed tabulation of all routes on the Thoroughfare Plan and a graphical representation of typical cross-sections can be found in Appendix B, and information related to subdivision ordinances is covered in Appendix C. The information covered in Appendix C should be particularly helpful to Harnett County as they take on the task of revising the existing subdivision ordinances.

Background

Harnett County, located in central North Carolina, is bisected by the Cape Fear River. Land use is primarily agricultural with the exception of denser commercial development within the urban boundaries of Dunn/Erwin and Lillington. Buies Creek, another small urban area in Harnett County, is the home of Campbell University. The major routes in the County include I 95, US 401, US 421, NC 24, NC 210, NC 27 and NC 87.

Highlights

Major highlights of the 1994 Harnett County Thoroughfare Plan are outlined below. The Thoroughfare Plan map is shown in Figure 1. Projects included in the 1995-2001 Transportation Improvement Program (TIP) are shown in parenthesis.

1. Widen NC 24/87 to a multilane facility. (R-2238)
2. Widen NC 24/27 to a multilane facility. (R-2529)
3. Widen US 401 to a multilane facility. (R-2609)
4. Upgrade NC 210 South with some multilane sections. (R-2230)
5. Intersection improvements to NC 55/NC 210. (R-2804)
6. Roadway improvements along NC 55 with some multilane sections. (R-2540)
7. Widen NC 27 to provide 12-foot (3.66 m) lanes, paved shoulders, and turn lanes at major intersections from NC 24 to the Lillington Urban Planning Boundary.
8. Widen Buffalo Lake Rd (SR 1115) to provide 12-foot (3.66 m) lanes and turn lanes at major intersections.
9. Widen the following to provide 12-foot (3.66 m) lanes: McArther Rd, Mt Pisgah Ch. Rd, McDougald Rd, Buie Rd, Docs Rd, Nursery Rd, Ray Rd (SR 1280, SR 1214, SR 1229, SR 1213, SR 1116, SR 1117, SR 1121). Intersection improvements to provide a more direct north-south route.
10. Widen Kipling Rd (SR 1403) to provide 12-foot (3.66 m) travel lanes. Request that a further study be undertaken to determine the need for improvements at the intersections of US401/SR1403 and NC210/SR1403.

The North Carolina DOT and Harnett County are jointly responsible for the proposed thoroughfare improvements. Cooperation between the state and the county is of primary concern if the recommendations outlined above are to be successfully implemented. The plan has been mutually adopted by all parties, and it is the responsibility of the County to implement the plan following guidelines set forth in Chapter 3.

It is important to note that the recommended plan is based on anticipated growth within the County as indicated by past trends and future projections. Prior to construction of any of these projects, a more detailed study will be required to revisit development trends and to determine specific locations and design requirements.

ADOPTED BY:

Harnett County OCTOBER 11, 1994

Dept. of Transportation NOVEMBER 1, 1994

RECOMMENDED BY:

Statewide Planning OCTOBER 18, 1994

Public Hearing Date OCTOBER 11, 1994

LEGEND

	EXISTING	PROPOSED
FREEWAYS/EXPRESSWAYS		
OTHER		
MAJOR THOROUGHFARES		
MAJOR COLLECTORS		
MINOR COLLECTORS		
LIMITED ACCESS INTERCHANGES		

LEGEND

Figure 1

THOROUGHFARE PLAN

HARNETT COUNTY

NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS - PLANNING AND RESEARCH BRANCH

IN COOPERATION WITH THE

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

SEPTEMBER 19, 1994

SCALE

SCALE FOR ENLARGEMENTS

COPIES OF THIS MAP ARE AVAILABLE TO THE PUBLIC AT A NOMINAL COST FROM THE PUBLIC INFORMATION OFFICE, DIVISION OF HIGHWAYS, DEPARTMENT OF TRANSPORTATION RALEIGH, NORTH CAROLINA 27611

Chapter 2

Recommended Thoroughfare Plan

Intent of the Thoroughfare Plan

Transportation is the backbone of a regions economic vitality. Without an adequate transportation system people cannot easily reach their intended destination, goods cannot be delivered to market in a cost effective manner, and investors may look to invest in better served areas. Recent trends such as regional economies, "just in time" delivery, increased automobile ownership, and increased migration away from the central cities and towns are taxing our existing transportation system and requiring that we put more emphasis on planning for our transportation future.

A thoroughfare plan study identifies existing and future deficiencies in the transportation system, as well as uncovers the need for new facilities. The thoroughfare plan also provides a representation of the existing highway system by functional use. This use can be characterized as a part of the arterial street system, the collector street system, or the local street system. A full description of these various systems and their subsystems is given in Appendix A.

This chapter presents the thoroughfare plan recommendations. It is the goal of this study that the recommended plan set forth a transportation system that will serve the anticipated traffic and land development needs for Harnett County. The primary objective of this plan is to reduce traffic congestion and improve safety by eliminating both existing and projected deficiencies in the thoroughfare system.

Thoroughfare Plan Recommendations

Principal Arterials

NC 24/87 - Classified as a principal arterial, this route is a vital corridor through Harnett County. In addition to providing access between the City of Sanford and the Fayetteville Urbanized Area, in recent years this route has become a major commuter route into Fayetteville, Spring Lake, and the Fort Bragg region. The increased role that this route is serving is evidenced by the increased residential development through this corridor. Average daily traffic volumes along NC 24/87 in 1993 ranged from 8,600 to over 12,500 vehicles per day. The design and character of this roadway suggests that to maintain an acceptable level of traffic service, vehicles per day should not exceed 11,300.

Traffic projections for the planning year (2025) indicate that traffic on this facility could increase to 21,000 - 31,000 vehicles per day. To safely accommodate this increase in traffic, NC 24/87 should be widened to provide additional lanes. This recommended improvement has already been funded in the NCDOT Transportation Improvement Program (TIP), with construction scheduled to begin in 1996 (R-2238).

Minor Arterials

NC 24/27 - The section of NC 24 from NC 87 to Moore County is currently a 2-lane roadway that carries approximately 3,400 vehicles per day. This number is projected to increase to 8,400 by the design year (2025). This increase will be due primarily to increased residential growth in the area. The current TIP has identified the widening of this corridor to a multilane facility as a future need (R-2529). This need is based on providing a bypass around Carthage to NC 87. This improvement will provide a much needed east-west multilane facility for this region of the State.

US 401 - This roadway provides a major north-south connector from the Fayetteville Urbanized Area through central Harnett County and into the southern Wake County/Raleigh Urbanized Area. Traffic forecasts for this facility show daily volumes at or approaching capacity by the planning year. As development along this corridor continues to increase, changing the character of the roadway, a deterioration of this facility may occur more quickly. It is recommended that this facility be widened to accommodate a multilane roadway. This improvement is identified in the most recent TIP as project R-2609.

Major Collectors

NC 210 South - This 2-lane facility has been identified as a major commuter route between Lillington and the Spring Lake/Fayetteville Area. Daily traffic on this section is projected to reach a high of around 34,000 near the Cumberland County line to a low of 11,000 near the southern urban planning boundary for Lillington. This growth is expected to be the result of increased residential development around this corridor in Harnett County. Employment destinations for this new influx of development will be primarily in Fayetteville and Lillington. To accommodate the increases in traffic volumes, it is recommended that NC 210 from Spring Lake to Lillington be upgraded with some multilane sections (TIP R-2230).

NC 210 North - The section of NC 210 between the northern planning boundary of Lillington and the Town of Angier currently carries approximately 4,100 vehicles per day (vpd). The design and character of this roadway indicates that it can accommodate 11,300 vpd. Traffic projections for the design year are approaching 10,000 vpd. Although this section of NC 210 is not recommended for widening at this time, it is possible that with continued development through this corridor widening may be needed beyond the planning horizon. For this reason, it is important that Harnett County protect this roadway through subdivision regulations and building set backs to the extent possible.

NC 55/NC 210 - The core of development for the Town of Angier originates at the intersection of NC 55 and NC 210. The Harnett County Planning Department has identified this portion of the County as one of the projected growth areas. The continued spread of suburban development from the Raleigh Urban Area is also influencing growth in Angier. The increase in traffic around and through this intersection compromises operational safety and efficiency. To alleviate this problem, it is recommended that the approaches to this intersection be widened and that the intersection be improved (TIP R-2804)

NC 55 - This roadway provides access from I-95 through Dunn, Erwin, Coats, Angier, and into Wake County. Traffic forecasts indicate that by the year 2025, NC 55 could carry between 10,000 and 18,000 vehicles per day. NC 55 is a 2-lane roadway in the planning area and is not designed to accommodate this volume of traffic. To adequately handle future traffic volumes, it is recommended that NC 55 be improved with some multilane sections from US 421 in Erwin to NC 210 in Angier (TIP R-2540).

NC 27 - From NC 24 to the Lillington Urban Planning Boundary, NC 27 is a 2-lane, 20-foot (6.10 m) roadway that carries between 1,800 and 3,000 vehicles per day. The traffic growth along this corridor is not expected to reach the 12,300 vehicle per day capacity. However, the increased development occurring in the southwestern portion of Harnett County will bring about an increase in travel and turning movements along this roadway. To improve safety and operations along NC 27, widening to provide a minimum of two 12-foot (3.66 m) lanes with paved shoulders and turn lanes at major intersections is recommended.

Minor Collectors

Buffalo Lake Rd (SR 1115) - This roadway provides access to NC 27 and NC 24/87 from the residential development throughout the corridor. SR 1115 has two 10-foot (3.05 m) lanes, and carries less than 2,000 vehicles per day. Increased development along this roadway in addition to its attractiveness as a connection between NC 27 and NC 24/87 will increase traffic volumes on this route to approximately 4,000 vehicles per day by the design year. To improve safety and operations, it is recommended that this roadway be widened to provide a minimum 24-foot (7.32 m) cross-section with turn lanes at major intersections.

McArther Rd, Mt Pisgah Church Rd, McDougald Rd, Buie Rd, Docs Rd, Nursery Rd, Ray Rd (SR 1280, SR 1214, SR 1229, SR 1213, SR 1116, SR 1117, SR 1121) - Currently the only continuous route between US 421 and the growing southern portion of Harnett County is NC 210 to the east and NC 24/87 to the west, leaving a significant portion of the County without a continuous north-south route. To improve access in this portion of the county, it is recommended that the identified routes be widened to two 12-foot (3.66 m) lanes and that some intersections be realigned to provide a more direct path of travel. This improvement will neither change the function or name of these facilities, it will merely serve to improve existing movements at the major intersections.

Kipling Road (SR 1403) - Currently a 2-lane, 18-foot (5.49 m) roadway, SR 1403 serves as a minor collector carrying traffic to NC 42, US 401, and NC 210. This roadway also serves as a main connector to Harnett Central High School. Traffic volumes range from a high of 1,100 in the vicinity of the high school, to a low of 500 near the Town of Duncan. These volumes are expected to increase to 2,700 and 1,200 respectively by the design year. To improve safety and operations along this roadway, it is recommended that SR 1403 be widened to provide a minimum 24-foot (7.32 m) pavement.

Others - Other recommendations to improve safety and operations include the need for intersection improvements at the intersection of US 401/SR 1403 and the intersection with NC 210/SR 1403. It is recommended that the County request that a more detailed analysis of these intersections be conducted by the NCDOT Division Traffic Engineer to determine if safety improvements at these locations are warranted.

Public Involvement

The Harnett County Thoroughfare Plan was officially started in May of 1994 by a meeting with County Planning staff, and a presentation to the Harnett County Planning Board. On August 1, 1994, preliminary findings were presented to the Planning Board with members of the public present. Upon recommendation of the Planning Board, these findings were presented to the Harnett County Commissioners on September 19, 1994. The public was also present at this meeting and comments were received from the Commissioners. On October 109, 1994, a public drop-in session was held to discuss the findings of the Thoroughfare Plan study with members of the public on a one-to-one basis. Five members of the public attended and gave general comments. The Public Hearing for the Thoroughfare Plan was held on October 17, 1994. Members of the public were present, but no one gave public comment on the Plan. At the close of the Public Hearing, the County Commissioners moved to adopt the Harnett County Thoroughfare Plan. This Plan was adopted by the North Carolina Board of Transportation on November 4, 1994.

Chapter 3

Implementation of the Thoroughfare Plan

Once the thoroughfare plan has been developed and adopted, implementation is one of the most important aspects of the thoroughfare plan. Unless implementation is an integral part of this process, the effort and expense associated with developing the plan is lost. There are several tools available for use by the County to assist in the implementation of the thoroughfare plan. They are described in detail in this Chapter.

State-County Adoption of the Thoroughfare Plan

Harnett County and the North Carolina Department of Transportation (NCDOT) have mutually adopted the thoroughfare plan shown in Figure 1. This mutually adopted plan can serve as a guide for the NCDOT in the development of the road and highway system for the County. The approval of this plan by the County also enables standard road regulations and land use controls to be used effectively in the implementation of this plan.

Subdivision Controls

Subdivision regulations require every subdivider to submit to the County planning commission a plan of any proposed subdivision. It also requires that the subdivisions be constructed to meet certain standards. This process can be used to require the subdivision streets to conform to the thoroughfare plan and to reserve or protect necessary right-of-way for planned roads and highways that are to become a part of the thoroughfare plan. The construction of subdivision streets to adequate standards reduced maintenance costs and simplifies the transfer of streets to the State Highway System. Appendix D outlines the recommended subdivision design standards as they pertain to road construction.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient setbacks to provide for adequate sight distances and by requiring off-street parking.

Development Reviews

Driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and by the Traffic Engineering Branch of the NCDOT. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast

food restaurants, or large industries) may be comprehensively studied by staff from the Traffic Engineering Branch, Planning and Environmental Branch, and/or Roadway Design Unit of NCDOT. If done at an early stage, it is often possible to significantly improve the development's accessibility while preserving the integrity of the thoroughfare plan.

Funding Sources

Capital Improvements Program

A local capital improvement program makes it easier to build a planned thoroughfare system. A capital improvement program consists of two lists of projects. The first is a list of highway projects that are designated as a municipal responsibility and are to be implemented with municipal funds. The second is a list of local projects designated as State responsibility to be included in the Transportation Improvement Program. These funds are generally not applicable for county thoroughfare plans.

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document which lists all major construction projects the Department of Transportation plans for the next seven years. Similar to local Capital Improvement Program projects, TIP projects are matched with projected funding sources. Each year when the TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added.

During annual TIP public hearings, municipalities request projects to be included in the TIP. A Board of Transportation member reviews all of the project requests in a particular area of the State. Based on the technical feasibility, need, and available funding, the board member decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are also available for other projects such as: bridge replacement, highway safety, public transit, railroad crossings, and bicycle facilities.

Industrial Access Funds

If an Industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

Small Urban Funds

Small Urban funds are annual discretionary funds made to municipalities with qualifying projects. The maximum amount is $150,000 per year per project. A town may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 as a 13.5 year plan with four major goals for North Carolina's roadway network. These goals are:

1. To complete the remaining 1,716 miles (2,768 km) of four lane construction on the 3,600 mile (5,806 km) North Carolina Intrastate System.
2. To construct a multilane connector in Asheville and portions of multilane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.
3. To supplement the secondary roads appropriation in order to pave, by 1999, 10,000 miles (16,129 km) of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.
4. To supplement the Powell Bill Program.

The portion of this bill which will most benefit Harnett County is the paving of most, if not all, of the unpaved roads on the State maintained system by the end of the planning horizon. For more information on the Highway Trust Fund Law, contact the Program Development Branch of the North Carolina Department of Transportation.

Implementation Recommendations

The following table provides a break down of the projects recommended in the Harnett County Thoroughfare Plan and the corresponding method that would best suit the implementation of the given project.

Table 1
Funding Sources and Recommended Methods of Implementation

Projects	*Funding Source*				*Method of Implementation*			
	Local Funds	*TIP*	*Indust. Access*	*Small Urban*	*Tho. Plan*	*Subd. Ordinc.*	*Zoning*	*Devlp. Reviews*
NC 24/87		X			X			X
NC 27/27		X			X			X
US 401		X			X			X
NC 210		X			X			X
NC 55		X			X			X
NC55/NC210		X			X			
NC 27		X			X			X
Buffalo Lake Road						X		
Kipling Road						X		
North-South Connecter						X	X	

Construction Priorities and Cost Estimates

Construction priorities vary depending on what criteria are considered and what weight is attached to the various criteria. Most people would agree that improvements to the major thoroughfare system and major traffic routes would be more important than minor thoroughfares where traffic volumes are lower. To be in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to cost and should not be prohibitively disruptive to the environment. The potential cost estimate of the major Harnett County projects with respect to the user benefits, and the probabilities that economic development will be stimulated and environmental impacts will be minimized are given in Table 2.

Table 2
Benefits Evaluation for Major Projects

Project	*Benefits (millions)*	*Cost* (millions)*	*Length (km)*	*Benefits/ km*	*Economic Develpmnt.*	*Envirn. Impact*
NC 55 widening	34.6	20.1	11.9	2.9	0.63	+0.6/-0.2
NC 210 widening	174.6	13.6	18.7	9.3	0.63	+0.7/-0.2
US 401 widening	59.1	40.6	23.4	2.5	0.25	+0.3/-0.2
NC 24 widening	110.4	19.9	14.6	7.6	0.63	+0.3/-0.1

* Cost estimates were obtained from the 1995 -2001 Transportation Improvement Program

Reduced road user cost should result from any roadway improvement , from a simple widening to the construction of a new roadway to relieve congested or unsafe conditions. comparisons of the existing and the proposed facilities have been made in terms of vehicle operating costs, travel time costs, and accident costs. These user benefits are computed as total dollar savings over the 32 year design period using data such as project length, base year and design year traffic volumes, traffic speed, type of facility, and volume/capacity ratio.

The impact of a project on economic development potential is shown as the probability that it will stimulate the economic development of an area by providing access to developable land and reducing transportation costs. It is a subjective estimate based on the knowledge of the proposed project, local development characteristics, and land development potential. The probability is rated on a scale from 0 (representing no development potential) to 1.00 (representing excellent development potential).

The environmental impact analysis considers the effect of a project on the physical, social/cultural, and economic environment. Below is a list of the thirteen items that are considered when evaluating the impacts on the environment:

- air quality
- water resources
- soils and geology
- wildlife
- vegetation
- neighborhoods
- noise
- educational facilities
- churches
- parks and recreation facilities
- historic sites and landmarks
- public health and safety
- aesthetics

The environmental impact analysis also uses a probability rating from 0 to 1.00. A negative value is assigned to the probability to indicate a negative impact. The summation of both positive and negative impact probabilities with respect to these factors provides a measure of the relative environmental impacts of a project. Table 3 shows the probability scale used in the analysis. This table can be used as a guideline for interpreting the "Economic Development" and "Environmental Impact" values given in Table 2.

Table 3
Probability Estimation Guide

Subjective Evaluation	*Impact Probability*
Excellent - Very Substantial	1.00
Very good - Substantial	0.75
Good - Considerable	0.50
Fair - Some	0.25
Poor - None	0.00

Offsetting the benefits that would be derived from any project is the cost of its construction. A new facility, despite its high projected benefits, might prove to be unjustified due to the excessive costs involved in construction. The highway costs estimated in this report were derived from the projected project costs identified in the 1995-2001 Transportation Improvement Program. The anticipated right-of-way costs were broken out of the total project cost using an average cost per acre for property throughout Harnett County according to the respective project. Table 4 provides a break down of total project cost into construction cost and right-of-way cost for the major project proposals for the Thoroughfare Plan.

Table 4
Potential Project Cost Estimates for Major Projects

Project Description	*Construction Cost*	*Right-of-way Cost**	*Total Cost*
NC 55 widening	$20,000,000	$100,000	$20,100,000
NC 210 widening	$13,130,000	$470,000	$13,600,000
US 401 widening	$39,920,000	$680,000	$40,600,000
NC 24 widening	$19,830,000	$70,000	$19,900,000

* Right-of-way costs estimates were derived using average land costs/acre for Harnett County

Chapter 4

Analysis of Harnett County's Roadway System

This Chapter presents an analysis of the ability of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but on understanding their cause. Travel deficiencies may be localized and the result of a substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by the system deficiency such as a need for a bypass, loop facility, construction of missing links, or additional radials.

An analysis of the roadway system must first look at existing travel patterns and identify existing deficiencies. This includes roadway capacity and safety analysis. After the existing picture of travel in the area has been developed, the engineer must analyze factors that will impact the future system. These factors include forecasted population growth, economic development potential, and land use trends. This information will be used to determine future deficiencies in the transportation system.

Current Transportation Plans for Harnett County

Thoroughfare Plans

Thoroughfare plans are a tool to aid officials in the development of an appropriate street system. It is important that the communities within a County, and County officials cooperate as a team in the development of this transportation system. Plan development and implementation jointly undertaken will help ensure the development of an efficient system for travel throughout the County. The following thoroughfare planning studies are currently underway for Harnett County:

1. Dunn/Erwin, previous plan adopted in 1978
2. Lillington, previous plan adopted in 1982
3. Coats, previous plan adopted in 1983
4. Buies Creek, previous plan adopted in 1983
5. Angier, no previous plan

Transportation Improvement Program Projects

As covered in Chapter 3, the Transportation Improvement Program (TIP) is a seven year project planning document that lists the major transportation improvement projects that the Department of Transportation has planned. These projects include not only roadway projects, but also bridge projects, railroad crossings, bicycle facilities, and public

transportation. Harnett County has several roadway projects identified in the 1995-2001 TIP, these projects are listed below:

1. I-95, north of US 13 in Cumberland County to SR 1811 in Harnett County. Pavement and bridge rehabilitation.
2. I-95, mile post 59.7 in Cumberland County to mile post 77.85 in Harnett County. Mill and overlay roadway.
3. I-95, SR 1811 to Johnston County Line. Pavement and bridge rehabilitation.
4. NC 24-27, Carthage bypass to NC 87. Widen roadway to a multi-lane facility.
5. NC 24-87, SR 1451 (Manchester Road) in Spring Lake to Sanford City Limits. Widen roadway to four lanes.
6. NC 55, US 421 to US 401. Upgrade existing roadway.
7. NC 55-210, NC 210 and NC 55 in Angier. Widen approaches and improve intersection operation.
8. NC 210, Spring Lake to Lillington. Upgrade roadway with some multi-lane sections and other two lane improvements.
9. US 401, multi-lanes north of Fayetteville to Fuquay-Varina. Widen roadway to a multi-lane facility.

Existing Travel Patterns and Deficiencies

Traffic Demand

Travel demand is generally reported in the form of average daily traffic counts. Traffic counts are taken regularly at several locations within Harnett County by the North Carolina Department of Transportation. The 1993 average daily traffic counts for Harnett County are shown in Figure 2.

Width and Alignment Deficiencies

North Carolina's standard for highway construction calls for 11-foot (3.35 m) lanes on all highways with traffic volumes greater than 2,000 ADT (Average Daily Traffic) or design speeds greater than 50 miles per hour. This includes all primary arterials. A 9-foot (2.74 m) minimum lane width can be tolerated on collector roads with an ADT of less than 4,300 vehicles per day. The minimum level of service for minor collector roads dictates a 40 mph design speed during peak traffic conditions. These standards are summarized below in Table 5.

Table 5
Minimum Tolerable Lane Widths

Average Daily Traffic	*Principal Arterials*		*Minor Arterials*		*Collectors*	
	feet	*meters*	*feet*	*meters*	*feet*	*meters*
over 2,000	11	3.35	11	3.35	11	3.35
400 - 2,000	-	-	10	3.05	10	3.05
100 - 400	-	-	10	3.05	9	2.74
below 100	-	-	-	-	9	2.74

There are a number of roadways in Harnett County that have substandard widths. Because of the substantial cost of upgrading all secondary roads to standard, narrow widths may have to be tolerated until sufficient funds are available for improvements. The roads identified as a part of Harnett County's Thoroughfare Plan study are listed below:

- NC 27: SR 1209 - Lillington Urban Planning Boundary (UPB)
- NC 42: Chatham Co - Wake Co
- NC 82: Cumberland Co - Dunn/Erwin UPB
- NC 210: W City Limits of Angier - NC 55, and Willow St - Johnston Co
- NC 217: Cumberland Co - W Dunn UPB
- SR 1001: NC 24/27 - Lee Co
- SR 1006: N Buies Creek UPB - NC 210
- SR 1106: Moore Co - SR 1108
- SR 1117: SR 1116 - NC 24/87
- SR 1121: Fayetteville UPB - SR 1117
- SR 1128: NC 210 - SR 1117
- SR 1130: SR 1128 - NC 27
- SR 1133: NC 210 - NC 27
- SR 1205: Lee County - NC 87
- SR 1209: NC 27 - NC 87
- SR 1213: NC 27 - SR 1229
- SR 1291: NC 87 - Lee County
- SR 1403: NC 42 - SR 1542
- SR 1412: SR 1409 - Wake County
- SR 1441: W City Limits Angier - US 401
- SR 1500: SR 1551 - SR 1006
- SR 1532: SR 1538 - N Buies Creek UPB
- SR 1551: Johnston Co - SR 1581
- SR 1552: SR 1551 - Coats UPB
- SR 1703: Johnston Co - N Coats UPB
- SR 2016: E Lillington UPB - SR 1779
- SR 2021: US 401 - SR 1779
- SR 2027: US 401 - NC 217
- SR 2030: SR 2031 - SR 2045
- SR 2045: NC 210 - Cumberland Co
- SR 2048: SR 2045 - NC 210

Capacity Analysis of the Existing System

An indication of the adequacy of the existing major street system is a comparison of the traffic volumes with the ability of the streets to move traffic freely at a desirable speed. The ability of a street to move traffic freely, safely, and efficiently with a minimum delay is controlled primarily by the spacing of major devices utilized. Thus, the ability of a street to move traffic can be increased by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering strategies.

Capacity is the maximum number of vehicles that has a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given period under prevailing roadway and traffic conditions (*Highway Capacity Manual, Special Report 209, 1-3, 1985*). Roadway capacities and 1993 average daily traffic for the major thoroughfares in Harnett County are shown in Figure 2. There is currently only one facility in Harnett County that is over capacity, NC 24 between NC 87 and Cumberland County. Improvements to this roadway are funded in the most recent TIP and design is currently underway.

The relationship of traffic volumes to the capacity of the roadway will determine level of service (LOS) being provided. Six levels of service have been selected for analysis purposes. They are given letter designations from A to F with LOS A representing the best operating conditions and LOS F the worst.

The six levels of service are illustrated in Figure 3, and they are defined on the following pages. The definitions are general and conceptual in nature, but may be applied to urban arterial levels of service. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them. The 1985 Highway Capacity Manual contains more detailed descriptions of the levels of service as defined for each facility type.

1993 Average Daily Traffic
Roadway Capacity

1993
capacity

3200
11300

4600
12200

7600
11300

5500
9600

2900
12300

7000
11300

5800
12200

5300
11300

4100
11300

4300
11300

300
13000

4900
15000

3400
12300

7700
38000

1600
9000

2600
12300

8600
11300

3400
11300

4700
15000

3500
15000

4100
12300

950
15000

12500
11300

WAKE COUNTY
CHATHAM COUNTY
JOHNSTON COUNTY
MOORE COUNTY
CUMBERLAND COUNTY
SAMPSON COUNTY
LILLINGTON
DUNN

LEGEND

Figure 2

1993 AVERAGE DAILY TRAFFIC
OVER CAPACITY

HARNETT COUNTY

NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS—PLANNING AND RESEARCH BRANCH
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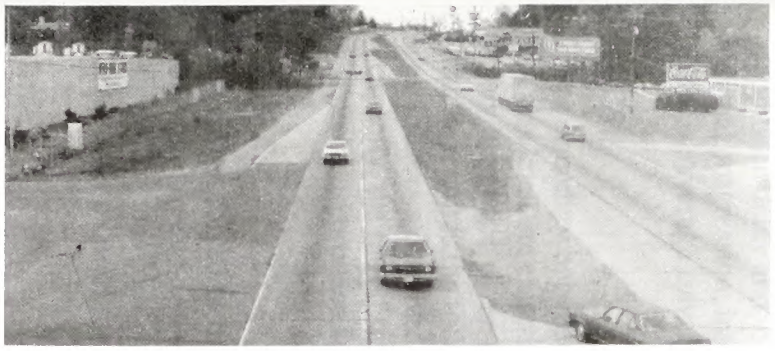
FEDERAL HIGHWAY ADMINISTRATION

SCALE

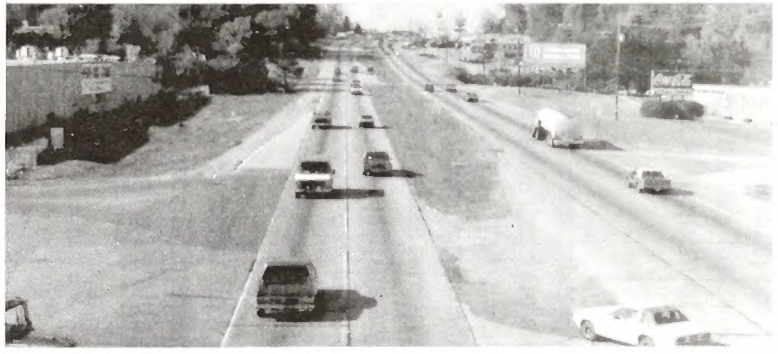
SCALE FOR ENLARGEMENTS

SHEET 1 OF 1



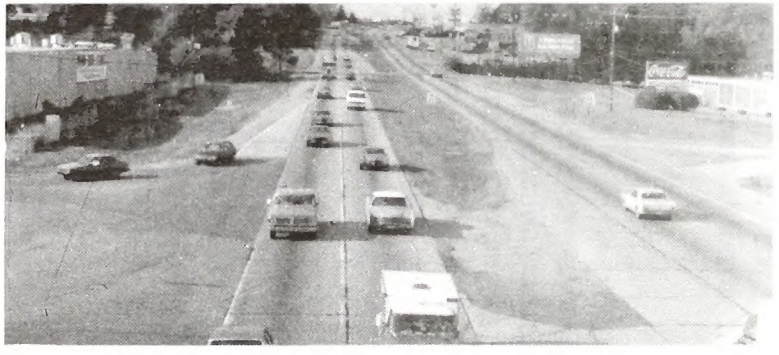
LEVEL OF SERVICE - A

LEVEL OF SERVICE - D



LEVEL OF SERVICE - B

LEVEL OF SERVICE - E



LEVEL OF SERVICE - C

LEVEL OF SERVICE - F

LEVELS OF SERVICE

Figure 3

Levels of Service

LOS A

Describes primarily free flow operations at average travel speeds usually about 90 percent of the free flow speed for the arterial class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Stopped delay at signalized intersections is minimal.

LOS B

Represents reasonable unimpeded operations at average travel speeds usually about 70 percent of the free flow speed for the arterial class. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tension.

LOS C

Represents stable operations. However, the ability to maneuver and change lanes in mid-block locations may be more restricted than in LOS B, and longer queues and/or adverse signal coordination may contribute to lower average travel speeds of about 50 percent of the average free flow speed for the arterial class. Motorists will experience an appreciable tension while driving.

LOS D

Borders on a range on which small increases in flow may cause substantial increases in approach delay and, hence, decreases in arterial speed. Delay may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these. Average travel speeds are about 40 percent of free flow speed.

LOS E

The boundary between LOS D and LOS E describes operations at **capacity**. Operations at this level are extremely unstable, because there are almost no gaps in the traffic stream. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or changing lanes, requires the following vehicles to give way to admit the vehicle. This condition establishes a disruption wave which propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce serious breakdown with extensive queuing.

LOS F

Describes forced or breakdown flow. The arterial flow is at extremely low speeds, below one-third to one-quarter of the free flow speed. Intersection congestion is likely at critical signalized locations, with high approach delays resulting. Adverse progression is frequently a contributor to this condition.

Traffic Accidents

Traffic accidents are often used as an indicator for locating congestion problems. Traffic accident records can also be reviewed to identify problem locations or deficiencies such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from analysis of accident data can lead to improvements that will reduce the number of accidents.

Table 6 is a summary of the accidents occurring in Harnett County between March of 1991 and February of 1994. This table only includes locations with 15 or more accidents, or locations that have less than 15 accidents but demonstrate a pattern in accident type. The "Total" column is the total number of accidents reported within a 100-foot (30.5 m) distance of the intersection during the study period indicated. The severity listed is the average accident severity for that location.

Table 6
Locations with 15 or More Accidents in a 3-Year Period

Location	*Angle*	*Ran Off Road*	*Rear End*	*Left Turn*	*Right Turn*	*Other*	*Total*	*Severity*
US 421/McArther	10	1		2		1	**14**	**12.64**
NC87/Olivia Rd	2	1	7	2	2	1	**15**	**9.45**
NC 87/Broadway	11		4	9			**24**	**14.94**
NC 210/Ray Rd	2	2	7	5	3	1	**20**	**8.24**
NC 210/Anderson Creek School	1	10		1		2	**14**	**17.76**
NC 55/Benson Rd		1	12			2	**15**	**7.03**
NC 55/NC 210	3		6	13		1	**23**	**15.10**
NC 55/Chalybeate Springs Road	2		1	13		4	**20**	**9.58**
NC 24/NC 87*		4	7				**11**	**14.16**

* less than 15 accidents, but represents a trend in accident types

Both the severity and number of accidents are considered when investigating accident data. The severity of every accident is measured with a series of weighting factors developed by NCDOT's Division of Highways. In terms of these factors, a fatal or incapacitating accident is 47.7 times more severe than one involving only property damage. An accident resulting in minor injury is 11.8 times more severe than one with only property damage.

As a part of this study, these accident locations were reviewed with the Division 6 Traffic Engineer. The Division is actively involved with investigating and improving many of these locations. Table 7 is a summary of the work completed or scheduled for these locations by the Division 6 office. To request a more detailed accident analysis for any of

the above mentioned intersections, or other intersections of concern, the County should contact the Division 6 Traffic Engineer.

Table 7
Project Status for Identified Accident Locations

Location	*Status*
US 421/McArther Rd	Existing flasher in operation
NC 87/Olivia Rd	Preparing to construct turn lanes
NC 87/Broadway	Existing flasher and turn lanes
NC 210/Ray Rd	Existing signal and turn lanes
NC 210/Anderson Ck School	No current plans
NC 210/NC 55 (Angier)	Existing signal. Town could not secure additional R/W at this time for the widening of NC 55
NC 55/Chalybeate Spr. Rd	NC 55 to be widened for left turn lane
NC 55/SR 1441 (Angier)	Signal requested, but does not meet warrants at this time
NC 87/NC24	Situation will be improved with the NC24/87 widening project

Existing Bridge Conditions

Bridges are a vital and unique element of a highway system. First, they represent the highest unit investment of all elements of the system. Second, any inadequacy or deficiency in a bridge reduces the value of the total investment. Third, a bridge presents the greatest opportunity of all potential highway failures for disruption of community welfare. Finally, and most importantly, a bridge represents the greatest opportunity of all highway failures for loss of life. For these reasons, it is imperative that bridges be constructed to the same design standards as the system of which they are a part.

Congress enacted the National Bridge Inspection Program Standards on April 27, 1971, implementing the Federal Highway Act of 1968. These standards require that "all structures designed as bridges located on any of the Federal-Aid Highway Systems be inspected and the safe load carrying capacity computed at regular intervals, not to exceed two years." A sufficiency index number has been calculated for each bridge to establish eligibility and priority for replacement. The bridges with the highest priority are replaced as Federal-Aid fund and State funds become available.

The North Carolina DOT's Bridge Maintenance Unit, with assistance from various consultants, inspect all bridges on the State Highway System. All bridges in Harnett

County have been analyzed, rated, and inventoried. The resulting data has been reduced to a more readily usable form as a management tool.

A sufficiency rating was used in the analysis to determine the deficiency of each bridge. The sufficiency rating is a method of evaluating factors that determine whether a bridge is sufficient to remain in service. Factors used include:

- structural adequacy and safety
- serviceability and functional obsolescence
- essentiality for public use
- type of structure
- traffic safety features

The result of this method is a percentage in which 100 percent represents an entirely sufficient bridge and zero percent represents an entirely insufficient or deficient bridge. A sufficiency rating of 50 percent or less qualifies for Federal Bridge Replacement Funds.

Deficient bridges are categorized as either functionally obsolete or structurally deficient. Bridges in the functionally obsolete category have below average ratings in approach roadway alignment, under clearance, deck geometry, waterway adequacy, or structural condition. Structurally deficient bridges have below average ratings in deck superstructure, substructure, overall structural condition, or waterway adequacy. Table 8 shows the functionally obsolete bridges in Harnett County. Table 9 shows the ten most structurally deficient bridges in Harnett County.

Table 8
Functionally Obsolete Bridges in Harnett County (ratings < 50.0)

Bridge No.	*Facility Carried*	*Location*	*Rating*
14	SR 1006	0.6 mi S of SR 1500	49.4
27	SR 1271	0.8 mi N of SR 1270	34.9
35	NC 42	0.1 mi W of SR 1401	44.9
36	NC 24	1.4 mi E of SR 1111	49.0
59	SR 1117	0.9 mi S of SR 1120	49.3
245	SR 2054	0.1 mi N of US 421/NC 27	42.5

Table 9
Ten Most Structurally Deficient Bridges in Harnett County

Bridge No.	*Facility Carried*	*Location*	*Rating*
31	SR 1265	0.8 mi W of SR 1273	16.3
33	SR 1229	1.0 mi E of SR 1213	15.7
51	NC 24	0.1 mi W of NC 87	14.3
55	SR 1130	0.5 mi S of SR 1131	7.9
75	SR 2031	0.2 mi S of SR 2044	5.0
92	SR 1403	0.9 mi E of SR 1418	18.5
96	SR 1403	0.4 mi E of SR 1425	11.0
100	SR 1552	0.3 mi S of SR 1555	11.2
102	SR 1769	1.2 mi S of SR 2015	14.3
103	SR 1769	1.2 mi N of NC 217	13.6

Of these ten most structurally deficient bridges, the following are included in the current Transportation Improvement Program:

- SR 1265, 0.8 mi W of SR 1273
- SR 1229, 1.0 mi E of SR 1213
- SR 1130, 0.5 mi S of SR 1131
- SR 2031, 0.2 mi S of SR 2044
- SR 1403, 0.9 mi E of SR 1418
- SR 1403, 0.4 mi E of SR 1425

Factors Affecting the Future Roadway System

The objective of thoroughfare planning is to develop a transportation system that will meet future travel demand and enable people and goods to travel safely and economically. To determine the needs of an area it is important to understand the role of population, economic, and land use.

Population

The amount of traffic on a section of roadway is a function of the size and location of the population it serves. Investigating past trends in population growth and forecasting future population growth and dispersion is one of the first steps for a transportation planner. Table 10 shows population forecasts for Harnett County. The County was divided into ten separate zones which consisted of townships with roughly the same types of land use

and level of development. The percent growth per year for past years was calculated using population data from 1940 through 1990. The future percent growth per year for each zone is based on new development currently taking place, proposed development, land availability, transportation access, and land use characteristics.

Table 10
Harnett County Population Forecasts

Zone	*Past %/Yr*	*Future %/Yr*	*1990 Pop.*	*2010 Pop.*	*2025 Pop.*
1	0%	1%	3,201	3,900	4,535
2	1%	1.5%	5,275	7,105	8,880
3	1%	0.5%	5,505	6,080	6,555
4	1%	0.5%	8,670	9,580	10,325
5	2%	1%	7,378	9,000	10,450
6	1%	1%	18,617	22,715	26,375
7	1%	0.5%	3,027	3,345	3,605
8	1%	2%	3,712	5,515	7,425
9	2%	2%	2,986	4,440	5,970
10	4%	2%	9,435	14,020	18,870

KEY for Townships:
Zone 1: Buckhorn, Hectors Creek
Zone 2: Black River
Zone 3: Upper Little River
Zone 4: Lillington, Neills Creek
Zone 5: Grove
Zone 6: Averasboro, Duke
Zone 7: Stewarts Creek
Zone 8: Barbecue
Zone 9: Johnsonville
Zone 10: Anderson Creek

Economy and Employment

One of the more important factors to be considered in estimating the future traffic growth of an area is its economic base. The number of employers and the employee's income or purchasing power influences how much population can be supported in the area and the number of motor vehicles that will be locally owned and operated. Generally, as the family income increases so does the number of vehicles owned, as well as the number of vehicle trips that will be taken each day by a particular household. An accurate projection of the future economy of the area is essential to estimating future travel demand.

Factors which will influence economic growth and development in Harnett County over the 30 year planning period include the expansion of the Fayetteville and Raleigh Urbanized Areas. Harnett County's location and land availability will make it and attractive alternative for potential homeowners desiring to locate away form the denser developments around these two cities. Increases in residential development will lead to increases in commercial and retail development.

Land Use

Land use refers to the physical patterns of activities and functions within a city or county. Nearly all traffic problems in a given area can attributed in some form to the type of land use. For example, a large industrial plant might be the cause of congestion during shift change hours as its workers come and go. However, during the remainder of the day few problems, if any, may occur. The spatial distribution of different types of land use is the predominant determinant of when, where, and why congestion occurs. The attraction between different land uses and their association with travel varies depending on the size, type, intensity, and spatial separation of each.

For use in transportation planning, land uses are grouped into four categories:

1. Residential - all land devoted to the housing of people (excludes hotels and motels)
2. Commercial - all land devoted to retail trade including consumer and business services and offices
3. Industrial - all land devoted to manufacturing, storage, warehousing, and transportation of products
4. Public - all land devoted to social, religious, educational, cultural, and political activities

Anticipated future land use is a logical extension of the present spatial distribution. Determination of where expected growth is to occur within the planning area facilitates the location of proposed thoroughfares or the improvements of existing thoroughfares. Areas of anticipated development and growth in Harnett County include:

1. Residential - southwestern, central
2. Commercial/Retail - southwestern, central, eastern
3. Industrial - eastern, central
4. Public - continued preservation of the Raven Rock State Park and the Cape Fear River.

The southwestern portion of the County is expected to have the largest growth. This area is served by three major routes - NC 87, NC 24, and NC 210. Other areas of high growth will likely be within the largest urban areas of Harnett County - Dunn/Erwin, Lillington, Coats, and Angier. The slowest growth is expected to occur in the midwestern portion of the County. This slow growth is attributed primarily to the environmentally sensitive area around the Cape Fear River, as well as the presence of the Raven Rock State Park.

Forecasted Travel Patterns and Deficiencies

Future Travel Demand

Future travel demand can be forecasted by looking at past traffic trends and calculating the average annual growth rates along any particular route. Average traffic growth in Harnett County ranges from a high of 10% per year to a low of 2% per year. Using these past trends along with projected land uses and forecasted population growth, the transportation planner is able to forecast future travel demand and to predict where future problems may occur. Figure 4 and Table B-1 in Appendix B provides forecasted traffic for the major and minor thoroughfares in Harnett County.

Capacity Deficient Corridors

Capacity deficient corridors were determined using the volume/capacity ratio (V/C), with the projected traffic over the practical capacity of the facility. A V/C ratio less than one is tolerable. Based on this analysis, several roadways in Harnett County are anticipated to be inadequate by the planning year 2025. These routes are shown in red on Figure 5 and include:

- NC 87
- US 401N
- NC 55N
- NC 210
- Ray Rd (SR 1121)

Traffic congestion on these routes can be alleviated by widening to increase traffic carrying ability. See Chapter 2 for recommendations.

Streets Approaching Capacity

Analysis indicates that several routes will be approaching capacity by the planning year 2025. These routes are shown in green on Figure 5. Other roadways in the planning area are not expected to have congestion problems within the planning period. However, to improve safety and operating conditions, it is recommended that the roadways designated as either major or minor thoroughfares with lane widths less than 12-feet (3.66 m) be upgraded to reflect this desired width.

System Deficiencies

System deficiencies result from a lack of a cohesive, continuous, and complimentary major street network. More simply put, a system deficiency exists when drivers must go out of their way to get from point A to point B, or when the path for getting there is not cohesive or continuous. The thoroughfare plan study identified a system deficiency for traffic traveling between US 421 and the Fayetteville Urban Area. A possible means for improving this traffic flow is addressed in Chapter 2. Other system deficiencies that were identified due to substandard design are shown in yellow on Figure 5.

2025 Average Daily Traffic
Roadway Capacity

2025
capacity

7800
11300

10000
12200

16600
11300

13500
9600

6500
12300

17000
11300

13000
11300

12700
12200

9600
11300

10000
11300

700
13000

9100
15000

6700
12300

18900
38000

4000
9000

21300
11300

6400
12300

11000
15000

8100
15000

9000
12300

2300
15000

8400
11300

31000
11300

CHATHAM COUNTY
WAKE COUNTY
JOHNSTON COUNTY
LEE COUNTY
MOORE COUNTY
CUMBERLAND COUNTY
SAMPSON COUNTY
CAPE FEAR RIVER
LILLINGTON
DUNN

LEGEND

Figure 4

2025 AVERAGE DAILY TRAFFIC
OVER CAPACITY

HARNETT COUNTY

NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS—PLANNING AND RESEARCH BRANCH
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FEDERAL HIGHWAY ADMINISTRATION

KEY TO COUNTY ROAD NUMBERS

NOTE: MAP INCLUDES ONLY STATE MAINTAINED ROADS OR IMPORTANT NON-SYSTEM ROADS. MILEAGE NOT SHOWN ON FRONTAGE ROADS. ROADS SHOWN AS OF JAN. 1, 1985

SCALE

SCALE FOR ENLARGEMENTS

NO SCALE PROJECTION

SHEET 1 OF 2

LEGEND

Volume/Capacity = 0.81 – 0.99

Volume/Capacity > 0.99

Substandard Design

TIP Projects

TIP Numbers & Description R-2230

R-2609
Widen roadway to a multi-lane facility from existing multi-lane section north of Fayetteville to Fuquay-Varina.

R-2804
Widen approaches and improve intersection operation at NC 55 and NC 210 in Angier.

R-2238
Widen to four lanes from SR 1451 in Spring Lake to Sanford city limits.

R-2540
Upgrade existing roadway from US 421 to US 401.

R-2529
Carthage Bypass to NC 87. Widen roadway to a multi-lane facility.

R-2230
Upgrade roadway with some multi-lane sections and other two lane improvements from Spring Lake to Ullington.

CHATHAM COUNTY

LEE COUNTY

MOORE COUNTY

CUMBERLAND COUNTY

SAMPSON COUNTY

SEE ULLINGTON THOROUGHFARE PLAN

SEE BUIES CREEK THOROUGHFARE PLAN

SEE COATS THOROUGHFARE PLAN

SEE DUNN/ERWIN THOROUGHFARE PLAN

SEE FAYETTEVILLE THOROUGHFARE PLAN

Figure 5

ROADWAY DEFICIENCIES

HARNETT COUNTY

NORTH CAROLINA

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FEDERAL HIGHWAY ADMINISTRATION

SCALE

SCALE FOR ENLARGEMENTS

Intersection Deficiencies

Problems with intersection design or control can contribute to poor movement of traffic, increased traffic accidents, and driver irritation. Most of the major traffic intersections within Harnett County are located within the small urban areas throughout the County. These locations will be addressed in the individual studies for these areas.

Consideration of Environmental Factors

In the past several years, environmental considerations associated with highway construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act. Section 102 of this act requires the execution of an environmental impact statement (EIS) for road projects that have a significant impact on the environment. The EIS would cover the impact of the project of wetlands, water quality, historic properties, wildlife, and public lands. While this report does not cover the environmental concerns in as much detail as an EIS would, preliminary research was done on several of these factors and is included below.

Wetlands

In general terms, wetlands are lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The single feature that most wetlands share is soil or substrate that is at least periodically saturated with or covered by water. Water creates severe physiological problems for all plants and animals except those that are adapted for life in it or in saturated soil.

Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing flood waters. They help maintain the quality of our water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one third of the plant and animal species that are federally listed as threatened or endangered. None of the proposed Harnett County projects will have a major impact on wetlands.

Threatened and Endangered Species

A preliminary review of the Federally Listed Threatened and Endangered Species within Harnett County was done to determine the effects that any proposed improvements could have on these species. These species were identified using mapping from the North Carolina Department of Environment, Health, and Natural Resources.

The Threatened and Endangered Species Act of 1973 allows the U.S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered plant and animals and critical

wildlife habitats. By locating rare species in the planning stage of road construction, we can avoid or minimize these impacts.

There were various sightings for rare plants throughout Harnett County, as well as several areas identified as priority areas for threatened or endangered species. Projects of particular concern with respect to rare plant include:

1. NC 24/87 widening
2. NC 24/27 widening
3. US 401 widening

A detailed field investigation of these corridors is recommended prior to the construction of any of these projects.

Historic Sites

The location of historic sites in Harnett County was investigated to determine the possible impact of the various projects studied. The federal government has issued guidelines requiring all State Transportation Departments to make special efforts to preserve historic sites. In addition, the State of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below:

> ***National Historic Preservation Act*** - Section 106 of this act requires the Department of Transportation to identify historic properties listed in the National Register of Historic Places and properties eligible to listed. The DOT must consider the impact of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.
>
> ***NC General Statute 121-12(a)*** - This statute requires the DOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. DOT must consider impacts and consult with the North Carolina Historical Commission, but it is not bound by their recommendations.

The State Plan for Historic Preservation has several sites listed within Harnett County. Most of these sites are located within the Dunn/Erwin Planning Area and preliminary investigations show that none of the sites identified will be affected by the proposed improvements.

APPENDICES

Appendix A

Thoroughfare Planning Principles

There are many advantages to thoroughfare planning, but the primary mission is to assure that the road system will be progressively developed to serve future travel desires. Thus, the main consideration in thoroughfare planning is to make provisions for street and highway improvements so that, when the need arises, feasible opportunities to make improvements exist.

Benefits of Thoroughfare Planning

There are two major benefits derived from thoroughfare planning. First, each road or highway can be designed to perform a specific function and provide a specific level of service. This permits savings in right-of-way, construction, and maintenance costs. It also protects residential neighborhoods and encourages stability in travel and land use patterns. Second, local officials are informed of future improvements and can incorporate them into planning and policy decisions. This will permit developers to design subdivisions in a non-conflicting manner, direct school and park officials to better locate their facilities, and minimize the damage to property values and community appearance that is sometimes associated with roadway improvements.

County Thoroughfare Planning Concepts

The underlying notion of the thoroughfare plan is to provide a functional system of streets, roads, and highways that permit direct, efficient, and safe travel. Different elements in the system are designed to have specific functions and levels of service, thus minimizing the traffic and land service conflict.

In the county plan, elements are either urban or rural. In the urban planning area, the local municipality generally has planning jurisdiction. Outside the urban planning area, the county has planning jurisdiction. In those urban areas where no urban thoroughfare plan exists, elements are rural and are under the planning jurisdiction of the county.

Within the urban and rural systems, plan elements are classified according to the specific function they are to perform. A discussion of the elements and functions of the two systems follows.

Thoroughfare Classification Systems

Streets perform two primary functions, traffic service and land access, which when combined, are basically incompatible. The conflict is not serious if both traffic and land

service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely developed abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets that permit travel from origins to destinations with directness, ease and safety. Different streets in this system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict.

Urban Classification

In the urban thoroughfare plan, elements are classified as major thoroughfares, minor thoroughfares, or local access streets.

Major Thoroughfares

These routes are the primary traffic arteries of the urban are providing for traffic movements within, around, and through the area.

Minor Thoroughfares

Roadways classified under this type collect traffic from the local access streets and carry it to the major thoroughfare system.

Local Access Streets

This classification covers streets that have a primary purpose of providing access to the abutting property. This classification may be further classified as either residential, commercial and/or industrial depending upon the type of land use that they serve.

Due to the limited amount of detail that can be shown on a county thoroughfare plan, only urban major thoroughfares are shown.

Rural Classification

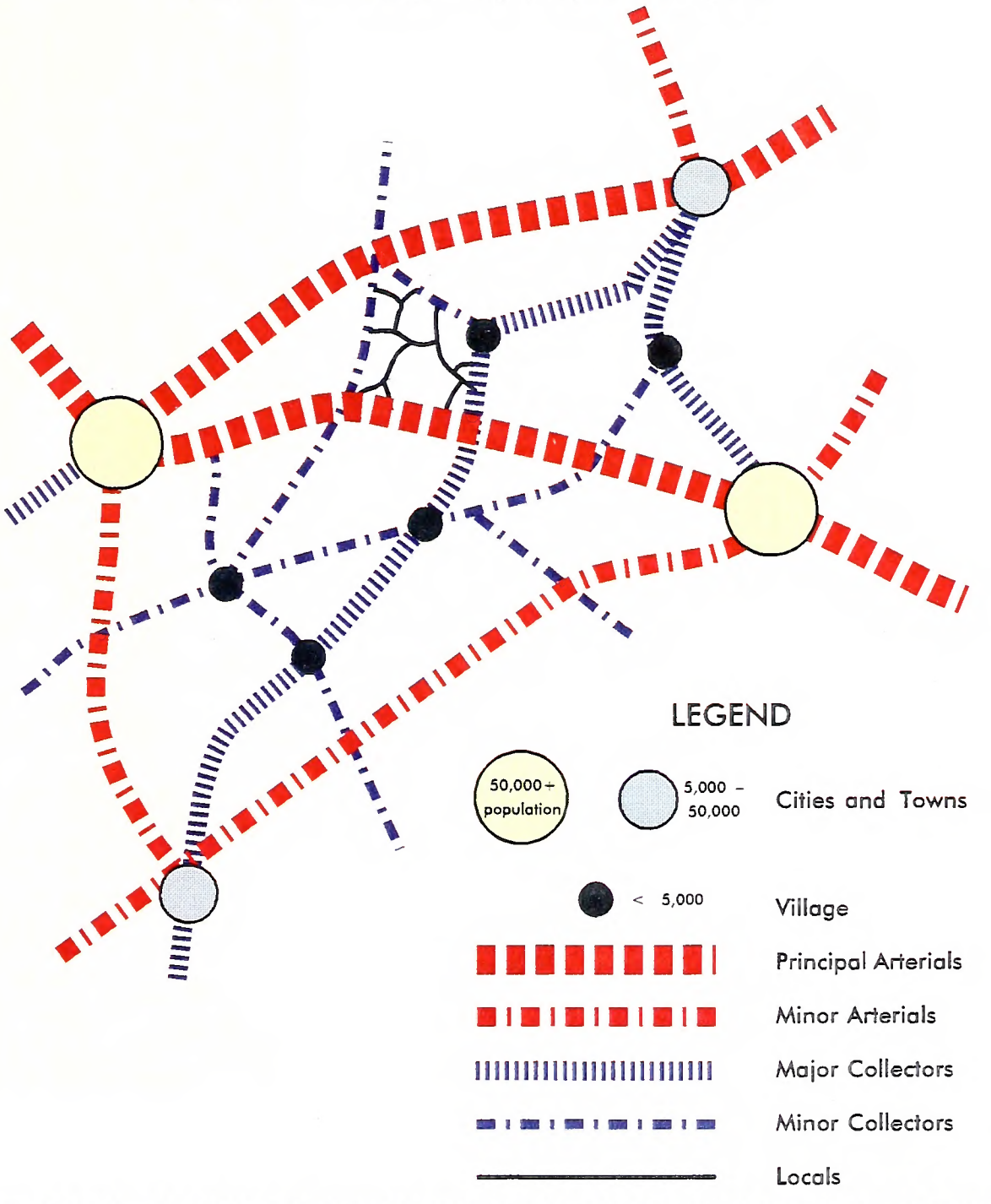
The facilities outside the urban thoroughfare planning boundaries make up the rural system. There are four major systems: principal arterials, minor arterials, major and minor collectors, and local roads.

Rural Principal Arterial System

This system is a connected network of continuous routes that serve corridor movements having substantial statewide or interstate travel characteristics. This will be shown by both the trip lengths and the travel densities. The principal arterial system should serve all urban areas of over 50,000 population and most of those with a population greater than 5,000. The Interstate system constitutes a significant portion of the principal arterial system.

Figure A–1

RURAL HIGHWAY NETWORK FUNCTIONAL CLASSIFICATION



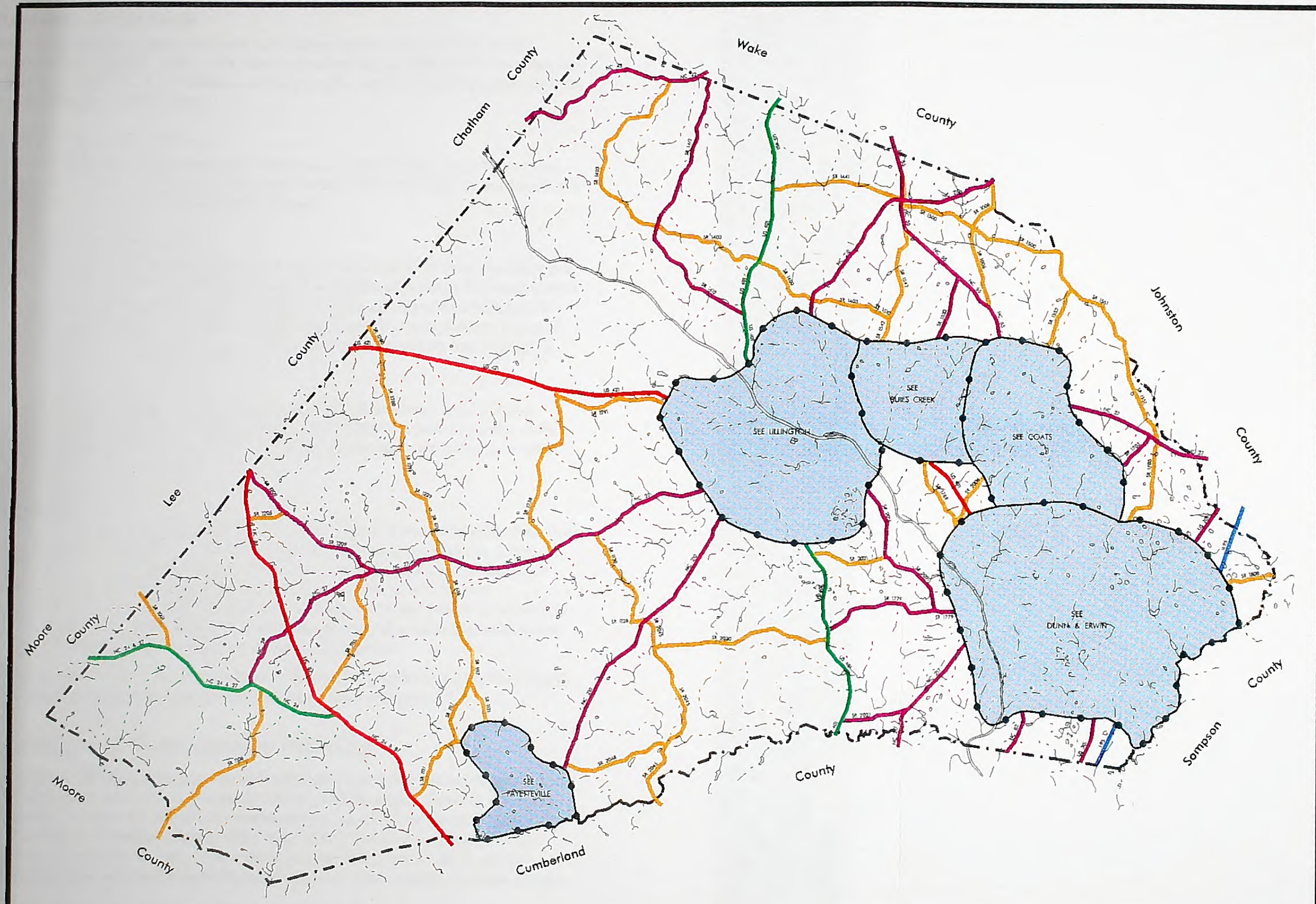


FIGURE A–2

LEGEND

- Freeways
- Other Principal Arterials
- Minor Arterials
- Major Collectors
- Minor Collectors

FUNCTIONALLY CLASSIFIED ROADS

HARNETT COUNTY
North Carolina

Rural Minor Arterial System

This system forms a network that links cities, larger towns, and other major traffic generators such as large resorts. The minor arterial system generally serves intrastate and intercounty travel and travel corridors with trip lengths and travel densities somewhat less than the principal arterial system.

Rural Collector Road System

The rural collector routes generally serve intracounty travel. These routes serve travel whose distances are shorter than on the arterial routes. The rural collector road system is subclassified into major and minor collector roads.

Major Collector Roads

These routes provide service to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intracounty importance, such as consolidated schools, shipping points, county parks, significant mining and agricultural areas, etc. Major collector roads also link these places to routes of higher classification and serve the more important intracounty travel corridors.

Minor Collector Roads

These collect traffic from local roads and bring all developed areas within a reasonable distance of a major collector road. They also provide service to the remaining smaller communities and link the locally important traffic generators with the rural outskirts.

Rural Local Road System

The local roads are all roads that are not on a higher system. Local residential subdivision streets and residential collector streets are elements of the local road system. Local residential streets are either cul-de-sacs, loop streets less than 2,500 feet (762.2 m) in length, or streets less than one mile (1.6 km) in length. They do not connect thoroughfares or serve major traffic generators and do not collect traffic from more that one hundred dwelling units. Residential collectors serve as the connecting street system between local residential streets and the thoroughfare system.

Figure A-1 gives a schematic illustration of a functionally classified rural highway system. The functional classification for Harnett County is shown in Figure A-2.

Objectives of Thoroughfare Planning

Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system to meet the existing and future travel desires within the urban area. The primary aim of a thoroughfare plan is to guide the development of the street system in a manner consistent with changing traffic demands. Through proper planning for street development, costly errors and needless expense can be averted. A thoroughfare plan will enable street improvements to be made as traffic demand increases,

and help eliminate unnecessary improvements. By developing the street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained that will require a minimum amount of land for street purposes. In addition to providing for traffic needs, the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial and industrial enterprises, affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

- To provide for the development of an adequate major street system as land development occurs;
- To reduce travel and transportation costs;
- To reduce the cost of major street improvements to the public through the coordination of street system with private action;
- To enable private interests to plan their actions, improvements, and development with full knowledge of public intent;
- To minimize disruption and displacement of people and businesses through long range planning for major street improvements;
- To reduce environmental impacts such as air pollution, resulting from transportation; and
- To increase travel safety.

These objectives are achieved through improving both the operational efficiency of thoroughfares, and improving the system efficiency by system coordination and layout.

Operational Efficiency

A streets operational efficiency is improved by increasing the capability of the street to carry vehicular traffic and people. In terms of vehicular traffic, a streets capacity is the maximum number of vehicles that can pass a given point on a roadway during a given period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include:

- **Street widening** - widening a street from two to four travel lanes, the capacity of the roadway more than doubles because additional maneuverability for the traffic has been provided
- **Intersection improvements** - increasing the turning radii, adding exclusive turn lanes, and channelizing movements can improve the capacity of an existing intersection

- **Improving vertical and horizontal alignment** - reduces the congestion caused by slow moving vehicles
- **Eliminating roadside obstacles** - reduced side friction and improves a driver's field of sight.

Operational ways to improve street capacity include:

- **Control of access** - a roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number
- **Parking removal** - increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles
- **One-way operation** - the capacity of a street can sometimes be increased 20-50%, depending upon turning movements and street width, by initiating one-way traffic operations. One-way streets also can improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination
- **Reversible lanes** - reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods
- **Signal phasing and coordination** - uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

- **Carpools** - encourage people to form carpools and vanpools for journeys to work and other trip purposes; this reduces the number of vehicles on the roadway and raises the people carrying capability of the street system
- **Alternate mode** - encourage the use of alternate modes of travel such as transit, bicycles, or walking for short distance trips
- **Work hours** - encourage industries, business, and institutions to stagger work hours or establish variable work for employees; this will reduce travel demand in peak periods and spread peak travel over a longer period
- **Land use** - plan and encourage land use development or redevelopment in a more travel efficient manner.

System Efficiency

Another means of altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, thoroughfare planning is done for established urban areas and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Through the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are listed below:

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, and the factors that contribute to it, limit it, and modify it.
2. Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of major traffic movements on a few streets.
3. The plan should conform to and provide for the land development plan for the area.
4. Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights-of-way for future thoroughfare development.
5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

Appendix B

Thoroughfare Plan Street Tablulation and Recommendations

This appendix includes a detailed tabulation of all the streets identified as elements of the Harnett County Thoroughfare Plan. The table includes a description of each section, as well as the length, cross-section, and right-of-way for each section. Also included are existing and projected average daily traffic volumes, roadway capacity, and the recommended ultimate lane configuration. Due to space constraints, these recommendations are given in the form of an alphabetic code. A detailed description of each of these alpha-codes and a illustrative figure for each can be found in Appendix C.

The following index of terms may be helpful in interpreting the table:

UPB - Urban Planning Boundary

CL - City Limits

ADQ - Adequate

UNK - Unknown

Co - County

L - lanes

LD - divided lanes

U - indicates an urban sections

Recc - Recommended

Street Section	Length		Cross Section		Right-of-way		Avg Daily Traffic		No. of Lanes		Capacity	
	miles	km	feet	meters	ft	meters	1993	2025	Existing	Recc.	Existing	Recc.
US 401												
Cumberland - Lillington UPB	5.90	9.52	28	8.54	100	30.49	3,500	8,100	2L	4LD/A	15,000	38,000
Lillington UPB - SR 1429	5.55	8.95	24	7.32	100	30.49	5,800	12,700	2L	5LU/C	12,200	28,000
SR 1429 - Wake Co	3.06	4.94	24	7.32	60	18.29	4,600	10,000	2L	4L/G	12,200	20,000
US 421												
W Dunn UPB - SR 2077	1.40	2.26	64	19.50	150	45.73	7,700	18,900	4LD	ADQ	38,000	ADQ
SR 2077 - E Buies Crk UPB	0.70	1.13	64	19.50	150	45.73	7,700	18,900	5LU	ADQ	31,700	ADQ
W Lillington UPB - Lee Co	10.90	17.58	24	7.32	100	30.49	4,900	9,100	2L	ADQ	15,000	ADQ
NC 24												
Moore Co - NC 87	9.03	14.56	25	7.62	60	18.29	3,400	8,400	2L	4L/G	11,300	20,000
NC 87 - Cumberland Co	5.17	8.34	30	9.15	150	45.73	12,500	31,000	2L	4LD/A	11,300	38,000
NC 27												
common NC 24	5.78	9.32	-	-	-	-	-	-	-	-	-	-
NC 24 - NC 87	2.34	3.77	20	6.10	60	18.29	3,100	8,000	2L	2L/K	11,300	15,000
NC 87 - SR 1209	3.51	5.66	22	6.71	60	18.29	1,800	4,400	2L	2L/K	12,300	15,000
SR 1209 - W Lillingotn UPB	11.83	19.08	20	6.10	60	18.29	2,600	6,400	2L	2L/K	11,300	15,000
E Coats UPB - Johnston Co	5.56	8.97	24	7.32	100	30.49	3,400	6,700	2L	ADQ	15,000	ADQ
NC 42												
Chatham Co - Wake Co	6.28	10.13	20	6.10	60	18.29	3,200	7,800	2L	2L/K	11,300	15,000
NC 55												
N Coats UPB - McIver St	5.59	9.02	24	7.32	60	18.29	4,300	10,000	2L	4LD/A	11,300	38,000
McIver St - Wimberly Rd	0.47	0.76	48	14.68	60	18.29	5,300	13,000	4L	5LU/C	24,300	28,000
Wimberly Rd - Dupree St	0.25	0.40	42	12.80	60	18.29	7,600	18,600	3L	5LU/C	11,300	28,000
Dupree St - Wake Co	1.06	1.71	24	7.32	60	18.29	7,600	18,600	2L	5LU/C	11,300	28,000
NC 82												
Cumberland Co - S Dunn UPB	1.20	1.94	18	5.49	100	30.49	950	2,300	2L	2L/K	15,000	15,000
NC 87												
NC 24 - Lee Co	8.82	14.23	24	7.32	150	45.73	8,600	21,300	2L	4LD/A	11,300	38,000

Street Section	*Length*		*Cross Section*		*Right-of-way*		*Avg Daily Traffic*		*No. of Lanes*		*Capacity*	
	miles	*km*	*feet*	*meters*	*ft*	*meters*	*1993*	*2025*	*Existing*	*Recc.*	*Existing*	*Recc.*
NC 210												
N Fayetteville UPB - SR 2048	0.10	0.16	24	7.32	60	18.29	13,800	34,200	2L	4LD/A	15,000	38,000
SR 2048 - S Lillington UPB	9.50	15.32	24	7.32	60	18.29	4,700	11,000	2L	4L/G	15,000	20,000
Lillington UPB - WCL Angier	5.08	8.19	24	7.32	60	18.29	4,100	9,600	2L	4LD/A	11,300	38,000
WCL Angier - NC 55	0.50	0.81	20	6.10	60	18.29	7,000	17,000	2L	4LD/A	11,300	38,000
NC 55 - Willow St	0.24	0.39	48	14.68	60	18.29	5,500	13,500	2LP	4LD/A	9,600	38,000
Willow St - Johnston Co	2.84	4.58	20	6.10	60	18.29	2,900	6,500	2L	2L/K	12,300	15,000
NC 217												
Cumberland Co - W Dunn UPB	3.55	5.73	20	6.10	60	18.29	4,100	9,000	2L	2L/K	12,300	15,000
SR 1001 (Claude White Rd)												
NC 24/27 - Lee Co	1.90	3.06	18	5.49	UNK	UNK	1,000	2,200	2L	2L/K	9,000	15,000
SR 1006 (Old Stage Rd)												
N Buies Creek UPB - NC 210	6.01	9.69	18	5.49	UNK	UNK	1,200	2,900	2L	2L/K	9,000	15,000
SR 1106 (Hillmon Grove Rd)												
Moore Co - SR 1108	10.70	17.26	18	5.49	UNK	UNK	430	2,900	2L	2L/K	9,000	15,000
SR 1108 (Cameron Hill Rd)												
SR 1106 - NC 24	12.50	20.16	20	6.10	60	18.29	600	1,400	2L	2L/K	11,000	15,000
SR 1115 (Buffalo Lake Rd)												
NC 27 - NC 87	4.58	7.39	20	6.10	UNK	UNK	1,600	4,000	2L	2L/K	11,000	15,000
SR 1116 (Docs Rd)												
SR 1117 - NC 27	3.20	5.16	22	6.71	UNK	UNK	1,100	2,600	2L	2L/K	12,000	15,000
SR 1117 (Nursery Rd)												
SR 1116 - NC 24/87	5.50	8.87	20	6.10	UNK	UNK	2,600	6,100	2L	2L/K	11,000	15,000
SR 1121 (Ray Rd)												
Fayetteville UPB - SR 1117	0.60	0.97	18	5.49	UNK	UNK	5,000	12,300	2L	2L/K	9,000	15,000

Street Section	Length		Cross Section		Right-of-way		Avg Daily Traffic		No. of Lanes		Capacity	
	miles	km	feet	meters	ft	meters	1993	2025	Existing	Recc.	Existing	Recc.
SR 1128 (Darroch Rd)												
NC 210 - SR 1117	4.80	7.74	18	5.49	UNK	UNK	1,200	2,700	2L	2L/K	9,000	15,000
SR 1130 (Norrington Rd)												
SR 1128 - NC 27	3.20	5.16	18	5.49	UNK	UNK	800	1,800	2L	2L/K	9,000	15,000
SR 1133 (Shawtown Rd)												
NC 210 - NC 27	1.61	2.60	18	5.49	UNK	UNK	1,600	3,600	2L	2L/K	9,000	15,000
SR 1205 (Olivia Rd)												
Lee Co - NC 87	1.68	2.71	18	5.49	UNK	UNK	1,500	3,100	2L	2L/K	9,000	15,000
NC 87 - SR 1209	1.18	1.90	22	6.71	UNK	UNK	800	1,900	2L	2L/K	12,000	15,000
SR 1209 (Barbecue Ch. Rd)												
NC 27 - NC 87	5.60	9.03	18	5.49	UNK	UNK	1,600	4,000	2L	2L/K	9,000	15,000
SR 1213 (Buie Rd)												
NC 27 - SR 1229	1.90	3.06	18	5.49	UNK	UNK	700	1,600	2L	2L/K	9,000	15,000
SR 1214 (Mt Pisgah Ch. Rd)												
SR1229 - US 421	4.30	6.94	18	5.49	UNK	UNK	400	900	2L	2L/K	9,000	15,000
SR 1229 (McDougald Rd)												
SR 1291 - SR 1213	10.50	16.94	18	5.49	UNK	UNK	600	1,300	2L	2L/K	9,000	15,000
SR 1213 - SR 1222	5.70	9.19	18	5.49	UNK	UNK	400	900	2L	2L/K	9,000	15,000
SR 1238 (Spring Hill Ch Rd)												
NC 27 - SR 1291	5.70	9.19	22	6.71	UNK	UNK	900	1,900	2L	2L/K	12,000	15,000
SR 1280 (McArther Rd)												
Lee Co - SR 1228	1.00	1.61	24	7.32	100	30.49	300	700	2L	ADQ	13,000	ADQ
SR 1228 - SR 1229	5.80	9.35	18	5.49	UNK	UNK	300	700	2L	2L/K	9,000	15,000
SR 1287 (name unknown)												
NC 87 - Lee Co	0.20	0.32	18	5.49	UNK	UNK	200	450	2L	2L/K	9,000	15,000

Street Section	*Length*		*Cross Section*		*Right-of-way*		*Avg Daily Traffic*		*No. of Lanes*		*Capacity*	
	miles	*km*	*feet*	*meters*	*ft*	*meters*	*1993*	*2025*	*Existing*	*Recc.*	*Existing*	*Recc.*
SR 1291 (Old US 421)												
W Lillington UPB - US 421	8.50	13.71	20	6.10	UNK	UNK	2,800	6,200	2L	2L/K	11,000	15,000
SR 1403 (Kipling Rd)												
NC 42 - US 401	10.60	17.10	18	5.49	UNK	UNK	500	1,200	2L	2L/K	9,000	15,000
US 401 - NC 210	2.30	3.71	18	5.49	UNK	UNK	800	2,000	2L	2L/K	9,000	15,000
NC 210 - SR 1542	2.70	4.35	18	5.49	UNK	UNK	1,100	2,700	2L	2L/K	9,000	15,000
SR 1412 (Christian Light Rd)												
US 401 - SR 1409	7.40	11.94	20	6.10	UNK	UNK	800	2,000	2L	2L/K	11,000	15,000
SR 1409 - Wake Co	1.80	2.90	18	5.49	UNK	UNK	1,600	3,900	2L	2L/K	9,000	15,000
SR 1441 (Chalybeate Sp. Rd)												
NC 55 - WCL Angier	0.44	0.71	20	6.10	UNK	UNK	1,900	4,600	2L	2L/K	11,000	15,000
WCL Angier - US 401	3.80	6.13	18	5.49	UNK	UNK	900	2,200	2L	2L/K	9,000	15,000
SR 1500 (Benson Rd)												
SR 1551 - SR 1006	2.80	4.52	18	5.49	UNK	UNK	1,300	2,700	2L	2L/K	9,000	15,000
SR 1006 - ECL Angier	2.10	3.39	20	6.10	UNK	UNK	1,300	3,000	2L	2L/K	11,000	15,000
ECL Angier - NC 55	1.69	2.73	24	7.32	UNK	UNK	2,400	5,600	2L	ADQ	13,000	ADQ
SR 1532 (Oak Grove Ch. Rd)												
Johnston Co - NC 55	3.80	6.13	18	5.49	UNK	UNK	350	700	2L	2L/K	9,000	15,000
NC 55 - SR 1538	3.60	5.81	20	6.10	UNK	UNK	1,000	2,100	2L	2L/K	11,000	15,000
SR 1538 - N Buies Creet UPB	0.10	0.16	18	5.49	UNK	UNK	1,000	2,100	2L	2L/K	9,000	15,000
SR 1542 (Old Buies Crk Rd)												
NC 55 - N Buies Crk UPB	4.00	6.45	20	6.10	UNK	UNK	1,200	2,600	2L	2L/K	11,000	15,000
SR 1551 (Johnston Co. Rd)												
Johnston Co - SR 1581	4.80	7.74	18	5.49	UNK	UNK	1,400	2,800	2L	2L/K	9,000	15,000
SR 1552 (Abattoir Rd)												
SR 1551 - Coats UPB	2.20	3.55	18	5.49	UNK	UNK	700	1,500	2L	2L/K	9,000	15,000

Street Section	Length		Cross Section		Right-of-way		Avg Daily Traffic		No. of Lanes		Capacity	
	miles	km	feet	meters	ft	meters	1993	2025	Existing	Recc.	Existing	Recc.
SR 1703 (Red Hill Ch. Rd)												
Johnston Co - N Coats UPB	1.80	2.90	18	5.49	UNK	UNK	2,500	5,800	2L	2L/K	9,000	15,000
SR 1705 (Fairground Rd)												
NC 27 - N Dunn UPB	3.10	5.00	22	6.71	UNK	UNK	1,100	2,400	2L	2L/K	12,000	15,000
SR 1779 (Bunnlevel Erwin Rd)												
US 401 - W Dunn UPB	4.10	6.61	24	7.32	60	18.29	1,600	3,600	2L	ADQ	13,000	ADQ
SR 2006 (Crawford Rd)												
W Coats UPB - SR 1769	1.90	3.06	18	5.49	UNK	UNK	290	700	2L	2L/K	9,000	15,000
SR 2016 (Ross Rd)												
E Lillington UPB - SR 1779	3.30	5.32	20	6.10	UNK	UNK	2,100	4,700	2L	2L/K	11,000	15,000
SR 2021 (Titan Roberts Rd)												
US 401 - SR 1779	4.90	7.90	18	5.49	UNK	UNK	1,300	2,600	2L	2L/K	9,000	15,000
SR 1779 - NC 217	1.70	2.74	20	6.10	60	18.29	180	350	2L	2L/K	11,000	15,000
SR 2027 (Horseshoe Bend)												
US 401 - NC 217	2.20	3.55	18	5.49	UNK	UNK	2,000	4,200	2L	2L/K	9,000	15,000
SR 2030 (McLean Chapel Rd)												
US 401 - SR 2031	1.05	1.69	20	6.10	UNK	UNK	1,200	2,500	2L	2L/K	11,000	15,000
SR 2031 - SR 2045	4.75	7.66	18	5.49	UNK	UNK	1,100	2,300	2L	2L/K	9,000	15,000
SR 2045 (Elliott Bridge Rd)												
NC 210 - Cumberland Co	6.50	10.48	18	5.49	UNK	UNK	1,300	2,800	2L	2L/K	9,000	15,000
SR 2048 (Bethel Baptist Rd)												
SR 2045 - NC 210	3.50	5.65	18	5.49	UNK	UNK	1,300	2,800	2L	2L/K	9,000	15,000

Appendix C

Typical Cross Sections

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way. Typical cross sections recommended by the Statewide Planning Branch are shown in Figure C-1. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

The recommended typical cross sections shown in Appendix B, Table B-1 were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each of the thoroughfares are listed in Appendix B. Recommendations for "ultimate" cross sections are provided for the following:

1. thoroughfares which may require widening after the current planning period
2. thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient
3. thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment

Recommended design standards relating to grades, sight distances, degree of curve, super elevation, and other considerations for thoroughfares are given in Appendix D.

A - Four Lanes Divided with Median - Freeway

Typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 14 m (46 feet), but a wider median is desirable.

B - Seven Lanes - Curb & Gutter

This cross section is not recommended for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

C - Five Lanes - Curb & Gutter

Typical for major thoroughfares, this cross section is desirable where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

D - Six Lanes Divided with Raised Median - Curb & Gutter / E - Four Lanes Divided with Raised Median - Curb & Gutter

These cross sections are typically used on major thoroughfares where left turns and intersection streets are not as frequent. Left turns would be restricted to a few selected intersections. The 4.8 m (16 ft) median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians may be used in urban areas. However, these types of medians result in greatly increased maintenance costs and an increased danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

F - Four Lanes Divided - Boulevard, Grass Median

Recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 7.3 m (24 ft) is recommended with 9.1 m (30 ft) being desirable.

G - Four Lanes - Curb & Gutter

This cross section is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

H - Three Lanes - Curb & Gutter

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "H".

I - Two Lanes - C&G, Parking both sides ; J - Two Lanes - C&G, Parking one side

Cross sections "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "I" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

K - Two Lanes - Paved Shoulder

This cross section is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 30 m (100 ft) should be required. In some instances, local ordinances may not allow the full 30 m. In those cases, 21 m (70 ft) should be preserved with the understanding that the full 30 m will be preserved by use of building setbacks and future street line ordinances.

L - Six Lanes Divided with Grass Median - Freeway

Cross section "L" is typical for controlled access freeways. The 14 m (46 ft) grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 70 m (228 ft) depending upon cut and fill requirements.

M - Eight Lanes Divided with Raised Median - Curb & Gutter

Also used for controlled access freeways, this cross sections may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

N - Five Lanes/C&G, Widened Curb Lanes ; O - Two Lane/Shoulder Section; P - Four Lanes Divided/Raised Median, C&G, Widened Curb Lanes

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross sections "N", "O", and "P" are typically used to accommodate bicycle travel.

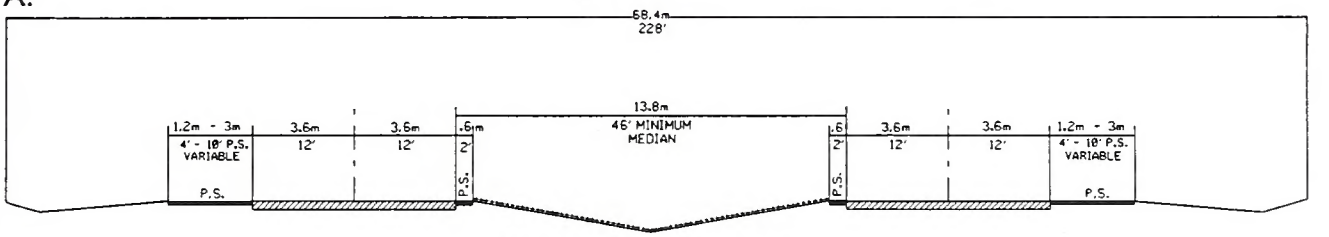
General

The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-ways shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

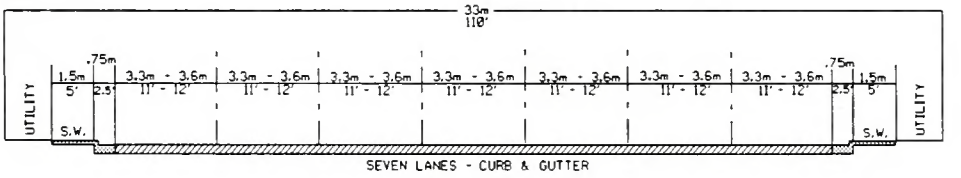
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



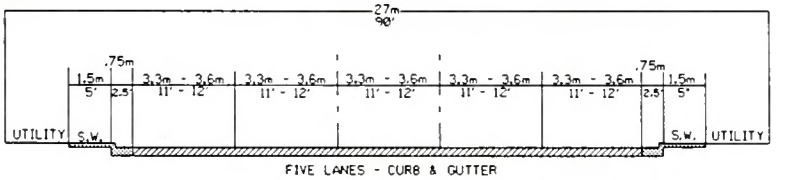
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



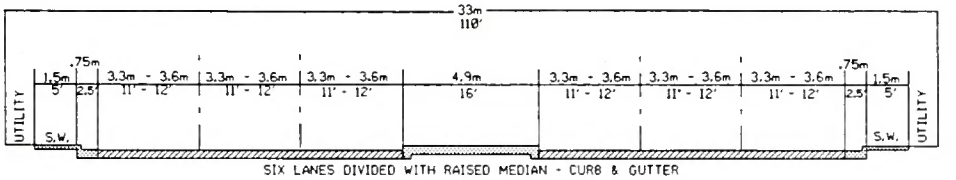
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

D.

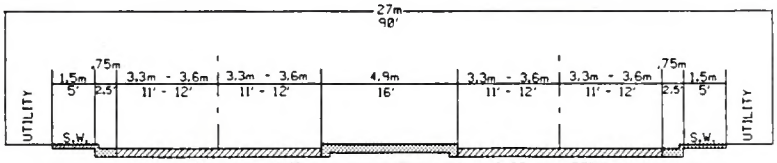


SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

FIGURE C–1

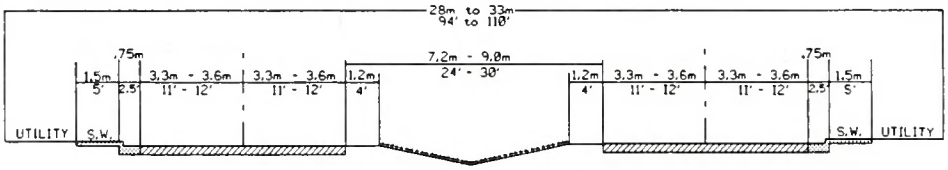
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



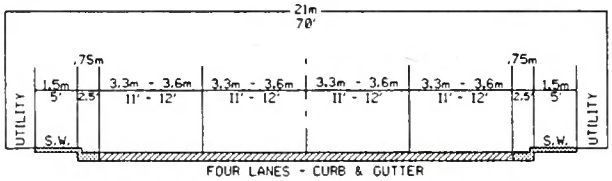
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



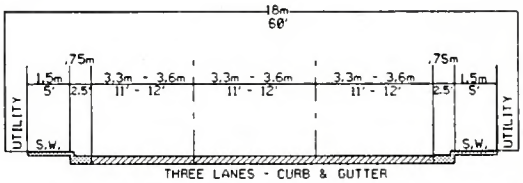
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



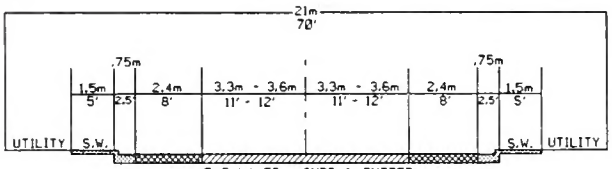
FOUR LANES - CURB & GUTTER

H.



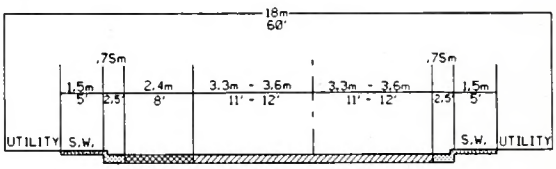
THREE LANES - CURB & GUTTER

I.



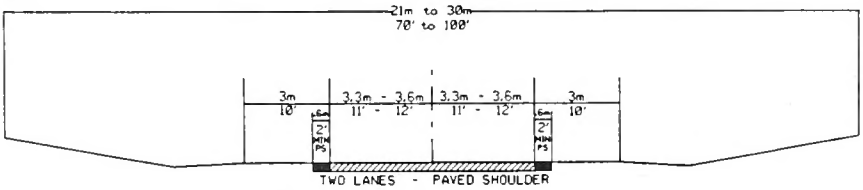
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

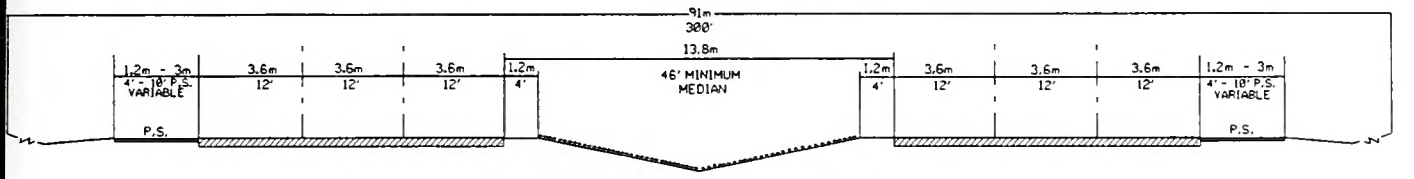
K.



TWO LANES - PAVED SHOULDER

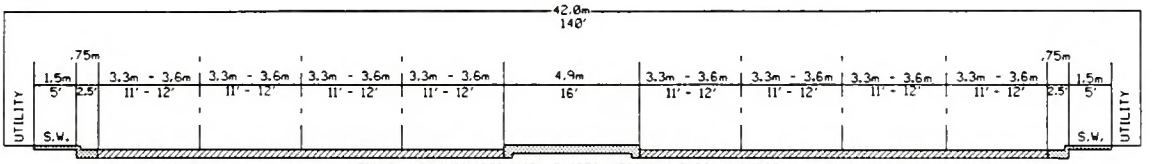
TYPICAL THOROUGHFARE CROSS SECTIONS

L.



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

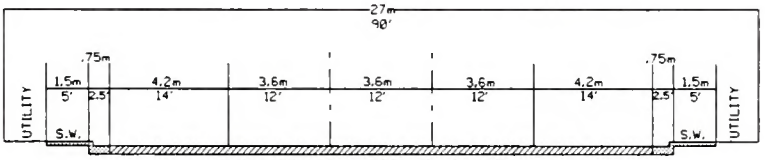
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

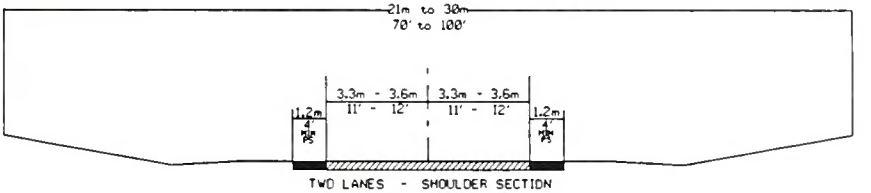
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



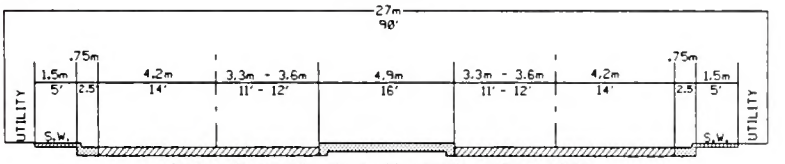
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

O.



TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

Appendix D

Recommended Subdivision Ordinances

Definitions

Streets and Roads

Rural Roads

1. *Principal Arterial* - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.
2. *Minor Arterial* - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.
3. *Major Collector* - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.
4. *Minor Collector* - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.
5. *Local Road* - A road which serves primarily to provide access to adjacent land, over relatively short distances.

Urban Streets

1. *Major Thoroughfares* - Major thoroughfares consist of Inter-state, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.
2. *Minor Thoroughfares* - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.
3. *Local Street* - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

1. *Freeway, expressway, or parkway* - Divided multilane roadways designed to carry large volumes of traffic at this speeds. A *freeway* provides for continuous flow of

vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An *expressway* is a facility with full or partial control of access and generally with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.

2. *Residential Collector Street* - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.
3. *Local Residential Street* - Cul-de-sacs, loop streets less than 750 meters in length, or streets less than 1.5 kilometers in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.
4. *Cul-de-sac* - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn around provided.
5. *Frontage Road* - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.
6. *Alley* - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

Property

Building Setback Line

A line parallel to the street in front of which no structure shall be erected.

Easement

A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

Lot

A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. (Also includes "plat" and "parcel").

Subdivision

Subdivider

Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

Subdivision

All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets.

The following shall not be included within this definition nor subject to these regulations:

- The combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein
- the division of land into parcels greater than four hectares where no street right-of-way dedication is involved
- the public acquisition, by purchase, of strips of land for the widening or the opening of streets
- the division of a tract in single ownership whose entire area is no greater than 0.8 hectares into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

Dedication

A gift, by the owner, of his property to another party without any compensation being given for the transfer. The dedication is made by written instrument and completed with an acceptance.

Reservation

Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

Streets and Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted. The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

Right-of-way Widths

Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

Table D-1
Minimum Right-of-way Requirements

Area Classification	*Functional Classification*	*Minimum ROW*
RURAL	Principle Arterial	Freeways -105 meters and Other - 60 meters
	Minor Arterial	30 meters
	Major Collector	30 meters
	Minor Collector	24 meters
	Local Road	18 meters[1]
URBAN	Major Thoroughfare	27 meters
	Minor Thoroughfare	21 meters
	Local Street	18 meters[1]
	Cul-de-sac	variable[2]

[1] The desirable minimum right-of-way (ROW) is 18 meters. If curb and gutter is provided, 15 meters of ROW is adequate on local residential streets.

[2] The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

The subdivider will only be required to dedicate a maximum of 30 meters of ROW. In cases where over 30 meters of ROW is desired, the subdivider will be required only to reserve the amount in excess of 30 meters. On all cases in which ROW is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width ROW, not less than eighteen meters in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required ROW shall be dedicated.

Street Widths

Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. *Local Residential*

    - Curb and Gutter section
        - 7.8 meters, face to face of curb
    - Shoulder section
        - 6 meters to edge of pavement, 1.2 meters for shoulders

2. *Residential Collector*

    - Curb and Gutter section
        - 10.2 meters, face to face of curb
    - Shoulder section
        - 6 meters to edge of pavement, 1.8 meters for shoulders

Geometric Characteristics

The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. *Design Speed* - The design speed for a roadway should be a minimum of 10 km/h greater than the posted speed limit. The design speeds for subdivision type streets are shown in Table D-2.

2. *Minimum Sight Distance* - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the parameters set forth in Table D-3.

3. *Maximum and Minimum Grades*

    - the maximum grades in percent are shown in Table D-4
    - minimum grade should not be less than 0.5%
    - grades for 30 meters each way from intersections (measured from edge of pavement) should not exceed 5%

4. *Superelevation* - Table D-5 shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

Table D-2
Design Speeds

Facility Type	*Desirable(km/h)*	*Minimum(km/h)*	
		Level	*Rolling*
Rural			
Minor Collector Roads	100	80	70
Local Roads	80	80	70
Urban			
Major Thoroughfares	100	80	80
Minor Thoroughfares	100	80	70
Local Streets	70	70	50

Table D-5
Sight Distance

Design Speed (km/h)	*Stopping Sight Distance (meters)*		*Minimum K[1] Value*	
	Minimum	*Desirable*	*Crest Curve*	*Sag Curve*
30	30	30	3	4
50	60	70	10	12
60	80	90	18	18
90	140	170	71	40
100	160	210	105	51

NOTE: General practice calls for vertical curves to be multiples of 10 meters. Calculated lengths shall be rounded up in each case.

[1]K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in meters of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "AASHTO, 1990".

Table D-4
Maximum Vertical Grade

Facility Type and Design Speed (km/h)	*Maximum Grade in Percent*		
	Flat	*Rolling*	*Mountainous*
Rural			
Minor Collector[1]			
30	7	10	12
50	7	9	10
60	7	8	10
90	6	7	9
100	5	6	8
110	4	5	6
Local Roads[1]			
30	-	11	16
50	7	10	14
60	7	9	12
90	6	8	10
100	5	6	-
Urban			
Major Thoroughfares			
50	8	9	11
60	7	8	10
90	6	7	9
100	5	6	8
Minor Thoroughfares[1]			
30	9	10	12
50	9	9	10
60	9	8	10
90	7	7	9
100	6	6	8
110	5	5	6
Local Streets[1]			
90	-	12	17
30	8	11	15
50	8	10	13
60	7	9	11
100	6	7	-

[1] For streets and roads with projected annual average daily traffic less than 250 or short steep grades less than 150 meters long, grades may be 2% steeper than the values in the table.

Table D-5
Superelevation

Design Speed (km/h)	*Minimum Radius at Maximum e*[1]		
	e=0.04	*e=0.06*	*e=0.08*
50	100	90	80
60	150	135	125
90	375	335	305
100	490	435	395

[1] e = rate of roadway superelevation, meter per meter

Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixth-five degrees.
2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.
3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 60 meters between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than one hundred and fifty (150) meters in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.
2. The width of an alley shall be at least six (6) meters.
3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead-end as may be required by the Planning Board.

Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

Offsets to Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 9 meters from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 1.8 meters from the face of curb.

Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

- shoulder section approach
    - under 800 ADT design year - minimum 8.4 meters width face to face of parapets, rails, or pavement width plus 3 meters, whichever is greater
    - 800 - 2000 ADT design year - minimum 10.2 meters width face to face of parapets, rails, or pavement width plus 3.6 meters, whichever is greater
    - over 2000 ADT design year - minimum width of 12 meters, desirable width of 13.2 meters width face to face of parapets or rails
- curb and gutter approach
    - under 800 ADT design year - minimum 7.2 meters face to face of curbs
    - over 800 ADT design year - width of approach pavement measured face to face of curbs
- where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 450 millimeters, or greater if sidewalks are required

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

- shoulder section approach - width of approach pavement plus width of usable shoulders on the approach left and right (shoulder width 2.4 m minimum, 3 m desirable)
- curb and gutter approach - width of approach pavement measured face to face of curbs

Metric Units

The following tables will be helpful to the reader in making conversions from the metric system into English units.

Table D-6
Metric Conversion Table

English Units	*Metric Units*	*Abbreviation*
1 inch	25 millimeters	mm
1 foot	0.3 meters	m
1 mile	1.6 kilometers	km
1 acre	2.47 hectares	hect

Table D-7
Metric Measurement Equivalents

Standard	*Equivalent*
1 millimeter	0.001 meters
1 kilometer	1000 meters
1 hectare	10,000 square meters

Appendix E

Index for Secondary Road Numbers

- SR 1001 - Claude White Rd
- SR 1006 - Old Stage Rd
- SR 1106 - Hillmon Grove Rd
- SR 1108 - Cameron Hill Rd
- SR 1115 - Buffalo Lake Rd
- SR 1116 - Docs Road
- SR 1117 - Nursery Road
- SR 1121 - Ray Road
- SR 1128 - Darroch Rd
- SR 1130 - Norrington Rd
- SR 1133 - Shawtown Rd
- SR 1205 - Olivia Rd
- SR 1209 - Barbecue Ch Rd
- SR 1213 - Buie Road
- SR 1214 - Mt Pisgah Ch Rd
- SR 1222 - Broadway Rd
- SR 1228 - McNeil Mill Rd
- SR 1229 - McDougald Rd
- SR 1238 - Spring Hill Ch Rd
- SR 1280 - McArthur Rd
- SR 1287 - name unknown
- SR 1291 - Old US 421
- SR 1403 - Kipling Road
- SR 1409 - Oakridge Duncan Rd
- SR 1412 - Christian Light Rd
- SR 1441 - Chalybeate Spr. Rd
- SR 1449 - Wake Co. Rd
- SR 1500 - Benson Rd
- SR 1532 - Oak Grove Ch. Rd
- SR 1538 - Mabry Rd
- SR 1542 - Old Buies Crk Rd
- SR 1551 - Johnston Co. Rd
- SR 1552 - Abattoir Rd
- SR 1581 - Baileys X-Rd
- SR 1703 - Red Hill Ch. Rd
- SR 1705 - Fairground Rd
- SR 1769 - Old Stage Rd
- SR 1779 - Bunnlevel Erwin Rd
- SR 2006 - Crawford Rd
- SR 2016 - Ross Rd
- SR 2021 - Titan Roberts Rd
- SR 2027 - Horseshoe Bend
- SR 2030 - McLean Chapel Rd
- SR 2031 - Wire Rd
- SR 2045 - Elliott Bridge Rd
- SR 2048 - Bethel Baptist Rd
- SR 2077 - Russ Drive